VI. RISK AND UNCERTAINTY:

Several areas of risk and uncertainty have been identified for the RTD alternative cost estimate. Uncertainties exist with relation to the exact volume that will be retrieved from the SDA and the characterization of that waste, especially the quantity that will require special handling or that cannot be disposed of (e.g., spent fuel). Primary areas of risk and uncertainty lie in the ability to perform the retrieval and treatment as described in the PERA, and whether production rates can be achieved for the duration.

The containment structures required for the RTD alternative are extremely large and the requirement to provide radiological controls is uncertain as it relates to costs and should be considered a variable. The design requirements for these containment structures are not fully known, because a safety analysis for this activity has not been performed. Costs for the actual structures could be substantially higher than estimated.

Alternatively, designing a modular structure might result in design that is modular, cost savings. Non-destructive assay techniques to separate TRU from non-TRU are not fully developed and require additional research and development. Further research and development is required for the thermal treatment, and may have deployment issues for waste treatment of the scale needed for this alternative. The production rates of the treatment facility are several times higher than the production rates for the AMWTP, and require round-the-clock operations to achieve, with very limited annual downtime for maintenance.

Considerable schedule risk is associated with the off-Site transportation of TRU waste to WIPP. The total number of shipments is extremely large; the public and political perception of this volume being transported on public roads could severely impact the schedule.

A significant uncertainty is the time and effort required to design and implement remediation systems for Pad A and the organics areas. Although the total areas are relatively small, they could have a significant impact on the cost. A hazard classification is not currently available for retrieving waste from Pad A and the ISTD treatment of the organics areas. It is unclear what level of safety analysis and design will be required for these components. It is unclear whether safety significant systems will be required.

The production rate for operations (for retrieval and grouting of the SDA) is dependent largely on the waste types encountered. Unexpected hazards (e.g., explosives, reactives, and pressurized containers) or simply impenetrable layers of waste could cause significant schedule delays.

The schedule is highly uncertain. Estimates included here are intended to be high-level examples and are not adequate for establishing the actual remediation schedule. At this time, many uncertainties regarding all aspects of the alternative (i.e., design, construction times, retrieval, ISTD treatment, grouting production rates) remain to estimate a schedule. Past experience demonstrated that years could be needed to obtain approval of a design or safety analysis for operations as simple as probing. Delays caused by obtaining approval internally, from DOE, or the regulatory agencies cannot be estimated at this time.

A risk associated with the cover system is any situation that results in losing using a primary borrow source located close to the site. The largest quantity of material needed for the cover system is silt loam. For this alternative, it is assumed that sufficient quantities of silt loam will be available from Spreading Area B, located near the site. If this source is lacking in capacity or otherwise unavailable, the nearest alternative sources are the Ryegrass Flats and the WRRTF borrow areas. Ryegrass Flats is 12 mi from the site and the WRRTF borrow area is 34 mi. The haul distance from Spreading Area B is 1.5 mi. Increased haul distances could result in a significant increase in the construction schedule and the cost of materials.

VII. ADDITIONAL TABLES:

Table 1. Transuranic pits, trenches, and Pad A with associated waste and soil volume for the retrieval, treatment, and disposal alternative.

Pit/Trench Number	(1) Volume of Non-TRU Waste (m^3)	(2) Volume of TRU Waste (m^3)	(3) Total Waste Volume[a] (m^3)	(4) Volume Contaminated Soil[b] (m^3)	(5) Volume of TRU-Contaminated Soil[c] (m^3)	(6) Volume of NonTRU-Contaminated Soil[d] (m^3)	(7) Volume TRU Waste and Soil[e] (m^3)	(8) Volume Non-TRU Waste and Soil[f] (m^3)	(9) Volume Clean Overburden (m^3)
1	3,650	2,190	5,840	1,410	705	705	2,895	4,355	3,520
2	6,070	3,250	9,320	13,550	3,250	10,300	6,500	16,370	11,110
3	1,305	685	2,000	10,200	685	9,515	1,370	10,820	5,930
4	6,240	4,660	10,900	21,670	4,660	17,010	9,320	23,250	15,820
5	4,280	3,500	7,780	23,930	3,500	20,430	7,000	24,710	15,390
6	3,755	3,105	6,860	9,180	3,105	6,075	6,210	9,830	7,790
9	2,320	1,700	4,020	9,260	1,700	7,560	3,400	9,880	6,450
10	9,260	6,650	15,910	16,660	6,650	10,010	13,300	19,270	15,820
11	213	210	420	6,820	210	6,610	420	6,823	3,520
12	1,005	885	1,890	6,830	885	5,945	1,770	6,950	4,240
Pits Total	**38,100**	**26,835**	**64,940**	**119,510**	**25,350**	**94,160**	**52,200**	**132,300**	**89,590**
PAD A	10,200	6	10,210	11,740	6	11,734	12	21,930	12,120
Pad A Total	**10,200**	**6**	**10,210**	**11,740**	**6**	**11,734**	**12**	**21,930**	**12,120**
T1	325	195	520	1,830	195	1,635	390	1,960	1,140
T2	170	100	270	2,050	100	1,950	200	2,120	1,140
T3	370	220	590	1,680	220	1,460	440	1,830	1,100
T4	400	240	640	1,650	240	1,410	480	1,810	1,110
T5	425	255	680	1,700	255	1,445	510	1,870	1,160
T6	400	240	640	1,650	240	1,410	480	1,810	1,110
T7	270	160	430	1,940	160	1,780	320	2,050	1,140
T8	405	245	650	1,640	245	1,395	490	1,800	1,110
T9	25	15	40	2,460	15	2,445	30	2,470	1,220
T10	205	125	330	2,030	125	1,905	250	2,110	1,140
Trenches Total	**3,000**	**1,795**	**4,790**	**18,630**	**1,800**	**16,840**	**3,590**	**19,830**	**11,370**
Volumes Total	**51,300**	**28,600**	**79,900**	**149,900**	**27,200**	**122,700**	**55,800**	**174,100**	**113,000**

a. Total Waste Volume equals the sum of Volume of Non-TRU Waste (1) and Volume of TRU Waste (2)
b. Total Volume Contaminated Soil equals insterstitial soil plus 1 ft contaminated underburden plus 1 ft contaminated overburden
c. Volume TRU Contaminated Soil equals the volume of contaminated TRU Waste
d. Volume Non-TRU contaminated Soil equals the total Volume of contaminated soil (column 4) minus the volume of TRU contaminated soil (column 5)
e. Total Volume of TRU Waste and Soil equals sum of columns 2 and 5
f. Total Volume of Non-TRU Waste and Soil equals sum of columns 1 and 6

Table 2. Necessary components and quantities for the onsite engineered landfill.

Liner System	Component	Quantity
Bottom liner	3-ft bentonite liner (low-perm soil layer)	33,750 yd^3
	Secondary geomembrane	22,500 yd^2
	Geocomposite drainage layer	22,500 yd^2
	Primary geosynthetic clay liner	22,500 yd^2
	Primary geomembrane	22,500 yd^2
	Geotextile cushion	22,500 yd^2
	1-ft drainage gravel	7,500 yd^3
	3-ft gravel operations layer	22,500 yd^3
	Geotextile separation	22,500 yd^2
Side slope liner	3-ft soil bentonite liner (low-perm soil layer)	21,420 yd^3
	Secondary geomembrane	14,280 yd^2
	Geocomposite drainage layer	14,280 yd^2
	Primary geosynthetic clay liner	14,280 yd^2
	Primary geomembrane	14,280 yd^2
	Geotextile cushion	14,280 yd^2
	Geotextile separation	14,280 yd^2
	3-ft gravel operations layer	14,280 yd^3

Table 3. Necessary components and quantities for the evaporation pond liner systems.

Liner System	Component	Quantity (yd^2)
Evaporation pond liner	Low-perm soil layer (3 ft)	41,500
	Secondary geomembrane	8,000
	Geocomposite	8,000
	Geosynthetic clay layer	8,000
	High-density polyethylene primary geomembrane	8,000
	Drainage gravel (1 ft)	2,000
	Geotextile separation	8,000
	Operation layer (3 ft)	8,000

Table 4. Treatment facility components and feed rates.

Treatment Facility Component	Feed Rate
Assay equipment—segmented gate conveyor systems	2.1 yd^3/hour
Assay equipment—box and drum counter	1.2 yd^3/hour
Waste separation system	3.3 yd^3/hour
Shredder system	550 lb/hour
Thermal treatment system	2,000 lb/hour
Off-gas system	2,500 ft^3/minute
Secondary liquid waste system	10 gal/minute
Solidification system	100 drums/day
Drum assay system (assume three)	100 drums/day
Super compactor	23.6 ft^3/hour
Drum assay system (assume five)	209 drums/day

Table 5. Estimated quantities of waste and soil to be treated and treatment rates.

	Transuranic (waste)	Transuranic (soil)	Transuranic (total)	Non-Transuranic (LLW) (waste)	Non-Transuranic (LLW) (soil)	Non-Transuranic (LLW) (total)	Total Waste Plus Soil
yd^3 per year	2,400	2,200	4,600	4,200	10,000	14,200	18,800
lb per hour (design)	500	1,000	1,500	900	4,500	5,400	6,900
Total volume (yd^3)	37,900	35,500	73,400	66,600	160,200	226,800	300,200

LLW = low-level waste

Table 6. Necessary components and quantities for the onsite engineered disposal facility cap.

Component	Quantity
1-ft topsoil layer	19,400 yd^3
8-ft engineered earth layer	154,800 yd^3
1-ft fine filter layer	19,400 yd^3
1-ft coarse filter layer	19,400 yd^3
2.5-ft coarse fractured basalt layer	48,400 yd^3
1-ft coarse filter layer	19,400 yd^3
1-ft fine filter layer	19,400 yd^3
60-mi high-density polyethylene geomembrane	58,100 yd^2
2-ft compacted clay layer	38,800 yd^3
Gas collection	9,700 yd^3

Table 7. Modified Resource Conservation and Recovery Act Subtitle C cover system, design layers, thickness, and volume.

Layer	Thickness	Approximate Volume[a]	Material Description
Topsoil with gravel	20 in.	296,000 CCY	Processed silt loam topsoil with pea gravel admixture from spreading Area B
Compacted topsoil	20 in.	296,000 CCY	Unprocessed silt from Spreading Area B
Sand filter layer	6 in.	89,000 CCY	Processed sand from the Borax Gravel Pit
Gravel filter layer	6 in.	89,000 CCY	Unprocessed gravel from the Borax Gravel Pit
Lateral drainage layer	6 in.	89,000 CCY	Processed gravel from the Borax Gravel Pit
Asphalt layer	6 in.	89,000 CCY	Asphalt from an off-Site source in Idaho Falls
Asphalt base course	4 in.	59,000 CCY	Base course from off-Site source in Idaho Falls
Gas collection layer	6 in.	89,000 CCY	Processed gravel from the Borax Gravel Pit
Grading fill	120 in.	1,775,000 CCY	Unprocessed silt loam from Spreading Area A
Fine filter	12 in.	6,000 CCY	Processed sand from Borax Pit for cover system toe armor; 16-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V sideslopes
Coarse filter	12 in.	6,000 CCY	Processed gravel from Borax Pit for cover system toe armor; 16-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V sideslopes
Coarse fractured basalt	12 in.	6,000 CCY	Processed basalt mined from an INEEL site for cover system toe armor; 16-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V
Riprap	36 in.	18,000 CCY	Processed basalt mined from an INEEL site for cover system toe armor; 16-ft long; 3-ft thick; 10,000-ft perimeter; 2.5H:1V
Riprap	36 in.	15,600 CCY	Processed basalt mined from an INEEL site for berm toe armor; 14-ft long; 3-ft thick; 10,000-ft perimeter; 2H:1V
Perimeter berm	NA	244,200 CCY	Unprocessed silt loam from Spreading Area A; berm average 6.5-ft high; 100-ft wide; 10,000-ft perimeter; 2H:1V

a. This table provides estimated in-place volume rounded to the nearest 100 CCY.
CCY = compacted cubic yards

Table 8. Summary of remedial design costs as percentages of capital and operating costs.

Technology	Percentage of Capital and Operating Costs
Capping (cover systems)	6
In situ grouting at Pad A	8
In situ thermal desorption	10
Foundation grouting	7
Retrieval and disposal	10

Table 9. Example feasibility study-level scope contingency percentages.

Remedial Technology	Scope Contingency (%)
Soil excavation	15 to 55
Synthetic cap	10 to 20
Clay cap	5 to 10
Surface grading and diking	5 to 10
Revegetation	5 to 10

Table 10. Summary of contingency costs as percentages of capital costs.

	Percent of Capital Cost		
Remedial Technology	Scope Contingency	Bid Contingency	Total Contingency
Capping	15	10	25
In situ grouting	20	15	35
Foundation grouting	20	15	35
In situ thermal desorption	25	25	50
Retrieval disposal	25	20	45

Table 11. Retrieval, treatment, and disposal—design and construction.

Activity Description	Estimated Duration
Borrow source investigation	1 year
Grout formulation and field testing	1 year (overlaps borrow source inv. by 1 year)
Remedial design and procurement	1.5 years (overlaps testing by 0.5 year)
Operational readiness review	1 year (no overlap with design)
Mobilization	0.5 year (no overlap with readiness assessment)
C-14 trench area grouting	0.5 year (no overlap with trench grouting)
Soil vault row grouting	1 year (no overlap with C-14 area grouting)
Foundation stabilization grouting	1 year (overlaps with C-14 area grouting)
Pad A retrieval and disposal	2 years (overlaps with grouting activities)
In situ thermal desorption	2 years (overlaps with grouting activities)
Waste treatment and support facility construction	Assumed 3 years
Preoperational testing and regulatory approval	1 year, predecessor to waste treatment
Waste retrieval and excavation	16 years (overlaps with waste treatment)
TRU and non-TRU waste segregation and treatment	16 years (overlaps with waste retrieval)
Earthen fill placement	2 years (overlaps with retrieval activities)
Gas gravel, asphalt, drainage, and filter layers	2 years (overlaps grading fill placement by 1 year)
Placement of remaining layers	1 year (overlaps asphalt and other layers by 0.5 year)
Vegetation establishment	2 years (no overlap with placement of remaining layers)

TRU = transuranic

Table 12. Required borrow materials for the modified Resource Conservation and Recovery Act Subtitle C Cover System

Material	Issue	One-way Haul Distance	Source
Topsoil	This material will consist of organic silt loam and will be used to construct a topsoil layer to support vegetation on top of the cover system.	1.5 mi	This material is assumed to be unprocessed organic silt loam derived from Spreading Area B.
Silt loam	This material will be used to construct a number of the layers within the cover system including the general site grading fill, perimeter berm, and topsoil.	1.5 mi	The majority of this material is expected to be unprocessed silt loam derived from Spreading Area B. Additional material is available from Ryegrass Flats (haul distance = 12 mi) and the WRRTF borrow area (haul distance = 34 mi). If permitted, some of this material could be excavated from Spreading Area B (haul distance = 1 mi).
Gravel	This material will be used for the gravel gas collection, drainage, and coarse filter layers within the cover system. Sufficient quantities of good structural gravel and fines materials are available.	2.5 mi	This material is assumed to be processed gravel derived from the Borax Gravel Pit.
Sand	This material will be used for the fine filter layers within the cover system. No identified bank run borrow areas are available within the INEEL boundary.	45 mi	This material is assumed to be processed sand derived from an off-Site borrow source.
Riprap	Riprap will be used for erosion control. The majority of the mined riprap material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.
Coarse fractured basalt	This material will be used for erosion control. The majority of the mined coarse fractured basalt material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.

INEEL = Idaho National Engineering and Environmental Laboratory
RWMC = Radioactive Waste Management Complex
WRRTF = Water Reactor Research Test Facility

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
FFA/CO MANAGEMENT AND OVERSIGHT											
WAG 7 Management (30-Years)											
Coordination/Oversight Tech Support - 1.0 FTE/YR		NA			60,000	HR	$ 93	$ 5,563,200			$ 5,563,200
Coordination with Agency Participants - 0.5 FTE/YR		NA			120,000	HR	$ 93	$ 11,126,400			$ 11,126,400
Environmental Engineering - 1.0 FTE/YR		NA			60,000	HR	$ 76	$ 4,540,200			$ 4,540,200
Cost and Schedule Control - 2.0 FTE/YR		NA			180,000	HR	$ 59	$ 10,600,200			$ 10,600,200
Regulatory Compliance - 1.0 FTE/YR		NA			120,000	HR	$ 79	$ 9,481,200			$ 9,481,200
Quarterly and Annual Reviews - 1.0 FTE/YR		NA			60,000	HR	$ 73	$ 4,360,800			$ 4,360,800
Audit Preparation and Coordination - 0.5 FTE/YR		NA			60,000	HR	$ 79	$ 4,740,600			$ 4,740,600
Health and Safety Coordination/Training - 2.0 FTE/YR		NA			180,000	HR	$ 62	$ 11,217,600			$ 11,217,600
Annual O&M Reports - 0.5 FTE/YR		NA			60,000	HR	$ 79	$ 4,712,400			$ 4,712,400
Attorney/Legal Fees, 0.3 FTE/YR		NA			60,000	HR	$ 150	$ 9,000,000			$ 9,000,000
Allocation for Other Direct Costs (ODCs) - 10% of Total Labor		NA			1	LS	$ 6,634,260	$ 6,634,260			$ 6,634,260
TOTAL COST - FFA/CO Management and Oversight											**$ 81,977,000**
Construction Management											
Construction Management (@ 6% of RA Costs)	6%	NA			1	LS	$ 253,424,580	$ 253,424,580			$ 253,424,580
General Conditions (@ 1.25% of RA Costs)	1.25%	NA			1	LS	$ 52,796,788	$ 52,796,788			$ 52,796,788
Health and Safety Equipment Allocation (@ 0.25% of RA Costs)	0.25%	NA			1	LS	$ 10,559,358	$ 10,559,358			$ 10,559,358
Medical Monitoring/Surveillance/Air Monitoring (@ 0.10% of RA Costs)	0.10%	NA			1	LS	$ 4,223,743	$ 4,223,743			$ 4,223,743
TOTAL COST - Construction Management											**$ 321,004,000**
TREATABILITY STUDIES											
Treatment Treatability Studies, Ex Situ Treatment (@ 10% of Treatment)	10%	NA			1	LS	$ 95,494,300	$ 95,494,300			$ 95,494,300
Treatment Treatability Studies, ISG/ISTD (@ 5% of ISG, ISTD)	5%	NA			1	LS	$ 6,988,050	$ 6,988,050			$ 6,988,050
TOTAL COST - Treatability Studies											**$ 102,482,000**
REMEDIAL DESIGN AND REMEDIAL ACTION PLANS/REPORTS											
ISTD RD/RA Workplan (@ 8% of ISTD Capital/Operation)	10%	NA			1	LS	$ 2,753,200	$ 2,753,200			$ 2,753,200
GROUTING RD/RA Workplan (@ 8% of Grouting Capital/Operations)	8%	NA			1	LS	$ 8,978,320	$ 8,978,320			$ 8,978,320
Excavation/Retrieval/Disposal RD/RA Workplan (@ 10% of Capital Costs)	10%	NA			1	LS	$ 94,998,100	$ 94,998,100			$ 94,998,100
Surface Barrier RD/RA Workplan (@ 6% of Barrier Construction)	6%	NA			1	LS	$ 3,173,640	$ 3,173,640			$ 3,173,640
Readiness Assessment (@ 1.5% of RA)	1.5%	NA			1	LS	$ 50,083,905	$ 50,083,905			$ 50,083,905
Remedial Action Report		NA			10,000	HR	$ 76	$ 756,700			$ 756,700
TOTAL COST - Remedial Design											**$ 160,744,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE
(continued).

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OU7-13/14 DRAFT COMPREHENSIVE FS
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REMEDIAL ACTION											
ISTD APPLICATION FOR VOC REMOVAL (1 acre)											
Capital Equipment Costs											
ISTD Control Trailer		6	EA	$ 325,000.00	NA				$ 1,950,000		$ 1,950,000
ISTD Off-Gas Treatment		6	EA	$ 250,000.00	NA				$ 1,500,000		$ 1,500,000
ISTD Off-Gas Treatment Support (Chillers)		6	EA	$ 725,000.00	NA				$ 4,350,000		$ 4,350,000
ISTD Capital Costs (Assume 6-ISTD Systems Are Required)		1	EA	$ 5,256,620.00	NA				$ 5,256,620		$ 5,256,620
Electrical Power Supply/Overhead Powerline H-Frame		3	MI	$ 375,000.00	NA				$ 1,125,000		$ 1,125,000
Electrical Substation/Transformers for Site Distribution		2	EA	$ 125,000.00	NA				$ 250,000		$ 250,000
Operation Treatment/Disposal Costs											
ISTD Operational Costs (acreage)		1	AC	$ 153,103.00	1	AC	$ 4,030,658	$ 4,030,658	$ 153,103		$ 4,183,761
Power Consumption/Utilities		NA			NA					$ 460,000	$ 460,000
ISTD Secondary Waste Disposal		NA			NA					$ 2,500,000	$ 2,500,000
Installation/Pre-Operational Set-up/Testing (Percentage of Total Capital Costs)	10.0%				1	LS	$ 1,458,472	$ 1,458,472			$ 1,458,472
Back-up Generators (Diesel Powered)		2	EA	$ 137,500	NA				$ 275,000		$ 275,000
Repair/Maintenance/Spare Parts (Percentage of Operating/Treatment Costs)	25.0%				1	LS	$ 1,007,665	$ 1,007,665			$ 1,007,665
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 486,330	NA				$ 486,330		$ 486,330
D&D Cost for Equipment (Percentage of Capital Equipment)	10.0%	NA			NA					$ 1,443,162	$ 1,443,162
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	746,441.04	$ 746,441			$ 746,441
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 539,849	$ 539,849
Subtotal											**$ 27,532,000**
PAD A EXCAVATION (Addressed elsewhere)											
Subtotal											$ -

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

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GROUTING											
EQUIPMENT COST											
Capital Cost - Batch Plant, Vehicles, Drill Rigs		1	LS	$ 8,326,000.0	NA				$ 8,326,000		$ 8,326,000
Mobilize/Erect Weather Structure Grouting Operations		2	EA	$ 750,198.0	NA				$ 1,500,396		$ 1,500,396
HEPA Filtration System/Lighting/Redundant Systems		2	EA	$ 2,147,448.0	NA				$ 4,294,896		$ 4,294,896
Back-up Generators (Diesel Powered)		2	EA	$ 375,000.0	NA				$ 750,000		$ 750,000
Building Foundation Construction		30,277	LF	$ 561.0	NA				$ 16,985,397		$ 16,985,397
Bridge Crane/Control System		3	EA	$ 670,000.0	NA				$ 2,010,000		$ 2,010,000
Bridge Crane/Control System/Modify and Install		NA			1	LS	$ 1,005,000	$ 1,005,000			$ 1,005,000
D&D Cost for Equipment/Enclosures	10.0%									$ 3,386,669	$ 3,386,669
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 873,101	$ 873,101			$ 873,101
Subcontractor Insurance/Bonds	2.0%				NA					$ 782,629	$ 782,629
Subtotal											**$ 39,914,000**
PRE-CONSTRUCTION ACTIVITIES											
Plug and Abandon (P&A) Existing GW Wells		NA			71	EA	$ 15,000	$ 1,065,000		$ 1,775,000	$ 2,840,000
Install New Nested GW Wells Outside Perimeter of Cap (Drilling Sub and Equipment)		NA			24	EA	$ 50,000	$ 1,200,000		$ 3,000,000	$ 4,200,000
Construct Rail Spur for Bulk Grout Delivery/Storage		1	LS	$ 1,200,000					$ 1,200,000		$ 1,200,000
INEEL Site-Specific Training/Work Order Requirements					1	LS	$ 164,700	$ 164,700			$ 164,700
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 168,094	$ 168,094
Subtotal											**8,573,000**
OPERATIONS											
5-Foot Thick Cover Material (Initial Site Grading)		130,000	CCY	$ 10	NA				$ 1,300,000		$ 1,300,000
Grout Activation/Fission Product Trench Areas		79	CD	$ 181,314	79	CD	$ 40,902	$ 3,231,258	$ 14,323,806		$ 17,555,064
Grout SVRs		34	CD	$ 181,314	34	CD	$ 40,902	$ 1,390,668	$ 6,164,676		$ 7,555,344
Grout Rig Decontamination		3	EA	$ 2,125,800	NA				$ 6,377,400		$ 6,377,400
HEPA Filtration System Operation		2	YR	$ 2,000,000	NA				$ 4,000,000		$ 4,000,000
Repair/Maintenance/Spare Parts (Percentage of Operating/Treatment Costs)	10.0%	1	LS	$ 3,325,815	NA				$ 3,325,815		$ 3,325,815
Verification Testing Geophysical Survey		4	MO	$ 94,588	2,500	HR	$ 76	$ 189,175	$ 378,350		$ 567,525
Foundation Stabilization Grouting (Other Trenches, 98-MD)		128	CD	$ 99,763	128	CD	$ 40,902	$ 5,235,456	$ 12,769,664		$ 18,005,120
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 2,035,959	NA				$ 2,035,959		$ 2,035,959
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 1,770,146	$ 1,770,146			$ 1,770,146
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,249,847	$ 1,249,847
Subtotal											**$ 63,742,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE
(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
ON-SITE ENGINEERED LANDFILL CONSTRUCTION											
Capital Equipment Costs											
Dozer D8 - Landfill Waste Placement		1	EA	$ 525,000	NA				$ 525,000		$ 525,000
825B - Landfill Compaction		1	EA	$ 675,000	NA				$ 675,000		$ 675,000
Water Truck for Landfill Dust Suppression		1	EA	$ 325,000	NA				$ 325,000		$ 325,000
Lining/Leachate Collection for Landfill											
Subgrade Prep/Grading to install lining and collection system		12	AC	$ 3,800	NA				$ 45,600		$ 45,600
Excavate and Grade Disposal Cell		110,000	CY	$ 8	NA				$ 880,000		$ 880,000
Low-Perm Soil Layer - 3-ft		55,170	CY	$ 12	NA				$ 662,592		$ 662,592
Secondary Geomembrane		36,780	SY	$ 6	NA				$ 231,714		$ 231,714
Geocomposite		36,780	SY	$ 2	NA				$ 82,755		$ 82,755
Geosynthetic Clay Liner		36,780	SY	$ 5	NA				$ 196,773		$ 196,773
Primary Geomembrane		36,780	SY	$ 6	NA				$ 231,714		$ 231,714
Geotextile Cushion		36,780	SY	$ 2	NA				$ 68,043		$ 68,043
1-ft Drainage Gravel		7,500	CY	$ 10	NA				$ 75,000		$ 75,000
Geotextile Separation		36,780	SY	$ 2	NA				$ 64,365		$ 64,365
Operation Layer - 3-ft		55,170	CY	$ 5	NA				$ 263,161		$ 263,161
Leachate Controls/Building		1	LS	$ 450,000	NA				$ 450,000		$ 450,000
Construct Leachate System/Transmission/Controls		1	LS	$ 325,000	NA				$ 325,000		$ 325,000
Equipment/Materials - Evaporation Pond											
Subgrade Prep		3	AC	$ 2,500	NA				$ 7,500		$ 7,500
Berm Construction for Evap Pond		41,500	CY	$ 5	NA				$ 197,955		$ 197,955
Low-Perm Soil Layer - 3-ft		8,000	CY	$ 12	NA				$ 96,080		$ 96,080
HDPE Secondary Geomembrane		8,000	SY	$ 6	NA				$ 50,400		$ 50,400
Geocomposite		8,000	SY	$ 2	NA				$ 18,000		$ 18,000
Geosynthetic Clay Liner		8,000	SY	$ 5	NA				$ 42,800		$ 42,800
HDPE Primary Geomembrane		8,000	SY	$ 6	NA				$ 50,400		$ 50,400
Geotextile Cushion		8,000	SY	$ 2	NA				$ 14,800		$ 14,800
1-ft Drainage Gravel		2,000	CY	$ 10	NA				$ 20,000		$ 20,000
Geotextile Separation		8,000	SY	$ 2	NA				$ 14,000		$ 14,000
Operation Layer - 3-ft		8,000	CY	$ 5	NA				$ 38,160		$ 38,160
Leachate Controls/Building		1	LS	$ 125,000	NA				$ 125,000		$ 125,000
Construct Leachate System/Transmission/Controls		1	LS	$ 225,000	NA				$ 225,000		$ 225,000
Construction/Operations											
Lab Geotechnical Testing/Compaction		16	MO	$ 125,000	NA				$ 2,000,000		$ 2,000,000
Field Geotechnical Testing/Compaction		16	MO	$ 90,000	NA				$ 1,440,000		$ 1,440,000
Surveying/Grade Control		16	MO	$ 65,000	NA				$ 1,040,000		$ 1,040,000
Third-Party Independent CQA Testing/Certification		16	MO	$ 75,000	NA				$ 1,200,000		$ 1,200,000
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 120,036	NA				$ 120,036		$ 120,036
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 280,363	$ 280,363			$ 280,363
Subcontractor Insurance/Bonds	2.0%	NA			NA					241,644	$ 241,644
Subtotal											$ 12,324,000

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
STRUCTURES											
General Administrative (Includes Equipment)		10,000	SF	$ 95	NA				$ 950,000		$ 950,000
Water and Chemical Storage Tanks		3	EA	$ 475,000	NA				$ 1,425,000		$ 1,425,000
Utility Piping/Gas Line		1	LS	$ 7,500,000	NA				$ 7,500,000		$ 7,500,000
Equipment Maint./Storage (Includes Equipment)		10,000	SF	$ 175	NA				$ 1,750,000		$ 1,750,000
Decontamination Area (Includes Equipment)		5,000	SF	$ 150	NA				$ 750,000		$ 750,000
Lag Storage Building (Includes Equipment)		70,000	SF	$ 250	NA				$ 17,500,000		$ 17,500,000
Treatment Facility (No Equipment)											
Materials and Erection		130,000	SF	$ 350	NA				$ 45,500,000		$ 45,500,000
Fire Protection, Radiological, CCTV, HVAC		130,000	SF	$ 250	NA				$ 35,750,000		$ 35,750,000
Weather Enclosure (WES) (Assume Bldg Footprint 10% Larger)		143,000	SF	$ 65	NA				$ 4,875,000		$ 4,875,000
WIPP Transportation Storage (Includes Equipment)		75,000	SF	$ 160	NA				$ 12,000,000		$ 12,000,000
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 3,072,000	$ 3,072,000			$ 3,072,000
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 2,621,440	$ 2,621,440
Subtotal											$ 133,693,000
PRIMARY/SECONDARY CONTAINMENT BUILDINGS											
Building No. 1, RCS Materials and Erection		208,075	SF	$ 350	NA				$ 72,826,250		$ 72,826,250
Building No. 1, RCS, Fire Protection, Radiological, CCTV, HVAC		208,075	SF	$ 250	NA				$ 52,018,750		$ 52,018,750
Weather Enclosure (WES) Building No. 1 (Assume Bldg Footprint 10% Larger)		228,883	SF	$ 65	NA				$ 14,877,363		$ 14,877,363
Building No. 2, RCS Materials and Erection		109,250	SF	$ 350	NA				$ 38,237,500		$ 38,237,500
Building No. 2, RCS, Fire Protection, Radiological, CCTV, HVAC		109,250	SF	$ 250	NA				$ 27,312,500		$ 27,312,500
Weather Enclosure (WES) Building No. 2 (Assume Bldg Footprint 10% Larger)		120,175	SF	$ 65	NA				$ 7,811,375		$ 7,811,375
Building No. 3, RCS Materials and Erection		109,250	SF	$ 350	NA				$ 38,237,500		$ 38,237,500
Building No. 3, RCS, Fire Protection, Radiological, CCTV, HVAC		109,250	SF	$ 250	NA				$ 27,312,500		$ 27,312,500
Weather Enclosure (WES) Building No. 3 (Assume Bldg Footprint 10% Larger)		120,175	SF	$ 65	NA				$ 7,811,375		$ 7,811,375
Building No. 4, RCS Materials and Erection		159,600	SF	$ 350	NA				$ 55,860,000		$ 55,860,000
Building No. 4, RCS, Fire Protection, Radiological, CCTV, HVAC		159,600	SF	$ 250	NA				$ 39,900,000		$ 39,900,000
Weather Enclosure (WES) Building No. 4 (Assume Bldg Footprint 10% Larger)		175,560	SF	$ 65	NA				$ 11,411,400		$ 11,411,400
Building No. 5, RCS Materials and Erection		102,600	SF	$ 350	NA				$ 35,910,000		$ 35,910,000
Building No. 5, RCS, Fire Protection, Radiological, CCTV, HVAC		102,600	SF	$ 250	NA				$ 25,650,000		$ 25,650,000
Weather Enclosure (WES) Building No. 5 (Assume Bldg Footprint 10% Larger)		112,860	SF	$ 65	NA				$ 7,335,900		$ 7,335,900
Building No. 6, RCS Materials and Erection		200,200	SF	$ 350	NA				$ 70,070,000		$ 70,070,000
Building No. 6, RCS, Fire Protection, Radiological, CCTV, HVAC		200,200	SF	$ 250	NA				$ 50,050,000		$ 50,050,000
Weather Enclosure (WES) Building No. 6 (Assume Bldg Footprint 10% Larger)		220,220	SF	$ 65	NA				$ 14,314,300		$ 14,314,300

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE
(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT:	WAG 7, FS COST ESTIMATES		
	OU7-13/14 DRAFT COMPREHENSIVE FS		PREPARED BY: BKC
SUBJECT:	RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE	TYPE OF ESTIMATE: PLANNING	CHECKED BY: BS/LL
LOCATION:	INEEL - RWMC		Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
Building No. 7, RCS Materials and Erection		197,400	SF	$ 350	NA				$ 69,090,000		$ 69,090,000
Building No. 7, RCS, Fire Protection, Radiological, CCTV, HVAC		208,075	SF	$ 250	NA				$ 52,018,750		$ 52,018,750
Weather Enclosure (WES) Building No. 7 (Assume Bldg Footprint 10% Larger)		217,140	SF	$ 65	NA				$ 14,114,100		$ 14,114,100
Building No. 8, RCS Materials and Erection		34,500	SF	$ 350	NA				$ 12,075,000		$ 12,075,000
Building No. 8, RCS, Fire Protection, Radiological, CCTV, HVAC		34,500	SF	$ 250	NA				$ 8,625,000		$ 8,625,000
Weather Enclosure (WES) Building No. 8 (Assume Bldg Footprint 10% Larger)		37,950	SF	$ 65	NA				$ 2,466,750		$ 2,466,750
Building No. 9, RCS Materials and Erection		70,000	SF	$ 350	NA				$ 24,500,000		$ 24,500,000
Building No. 9, RCS, Fire Protection, Radiological, CCTV, HVAC		70,000	SF	$ 250	NA				$ 17,500,000		$ 17,500,000
Weather Enclosure (WES) Building No. 9 (Assume Bldg Footprint 10% Larger)		77,000	SF	$ 65	NA				$ 5,005,000		$ 5,005,000
Building No. 10, RCS Materials and Erection		94,300	SF	$ 350	NA				$ 33,005,000		$ 33,005,000
Building No. 10, RCS, Fire Protection, Radiological, CCTV, HVAC		94,300	SF	$ 250	NA				$ 23,575,000		$ 23,575,000
Weather Enclosure (WES) Building No. 10 (Assume Bldg Footprint 10% Larger)		103,730	SF	$ 65	NA				$ 6,742,450		$ 6,742,450
Building No. 11, RCS Materials and Erection		77,400	SF	$ 350	NA				$ 27,090,000		$ 27,090,000
Building No. 11, RCS, Fire Protection, Radiological, CCTV, HVAC		77,400	SF	$ 250	NA				$ 19,350,000		$ 19,350,000
Weather Enclosure (WES) Building No. 11 (Assume Bldg Footprint 10% Larger)		85,140	SF	$ 65	NA				$ 5,534,100		$ 5,534,100
Building No. 12, RCS Materials and Erection		69,700	SF	$ 350	NA				$ 24,395,000		$ 24,395,000
Building No. 12, RCS, Fire Protection, Radiological, CCTV, HVAC		69,700	SF	$ 250	NA				$ 17,425,000		$ 17,425,000
Weather Enclosure (WES) Building No. 12 (Assume Bldg Footprint 10% Larger)		76,670	SF	$ 65	NA				$ 4,983,550		$ 4,983,550
Building No. 13, RCS Materials and Erection		35,100	SF	$ 350	NA				$ 12,285,000		$ 12,285,000
Building No. 13 RCS, Fire Protection, Radiological, CCTV, HVAC		35,100	SF	$ 250	NA				$ 8,775,000		$ 8,775,000
Weather Enclosure (WES) Building No. 13 (Assume Bldg Footprint 10% Larger)		38,610	SF	$ 65	NA				$ 2,509,650		$ 2,509,650
Building No. 14, RCS Materials and Erection		54,600	SF	$ 350	NA				$ 19,110,000		$ 19,110,000
Building No. 14, RCS, Fire Protection, Radiological, CCTV, HVAC		54,600	SF	$ 250	NA				$ 13,650,000		$ 13,650,000
Weather Enclosure (WES) Building No. 14 (Assume Bldg Footprint 10% Larger)		60,060	SF	$ 65	NA				$ 3,903,900		$ 3,903,900
Remote Crane System/Curtains/Water Misters		14	EA	$ 375,000	NA				$ 5,250,000		$ 5,250,000
Airlocks for Curtains		28	EA	$ 100,000	NA				$ 2,800,000		$ 2,800,000
Sheet Piles for Trenches or other Stabilization		1	LS	$ 2,500,000	NA				$ 2,500,000		$ 2,500,000
D&D Cost for Buildings/Equipment	25.0%	NA			NA					258,181,240.63	$ 258,181,241
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 24,845,399	$ 24,845,399			$ 24,845,399
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 26,365,032	$ 26,365,032
Subtotal											**$ 1,344,617,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
CLEAN SOIL OVERBURDEN REMOVAL/MANAGEMENT											
Overburden Soil Removal/Stockpile		113,000	CY	$ 5	NA				$ 539,010		$ 539,010
Soil Characterization of Stockpile (total CY/1000)		155	CY	$ 500	NA				$ 77,500		$ 77,500
Stockpile Management/Soil Erosion		16	YR	$ 30,000	NA				$ 480,000		$ 480,000
SOIL AND WASTE EXCAVATION											
Capital Equipment Costs											
Equipment/Containers		1	EA	$ 42,351,776	NA				$ 42,351,776		$ 42,351,776
Construction/Operations											
Excavate Waste/Segregate/Size Material (200 days/yr)		3,200	DAY	$ 6,768	3,200	DAY	30,383	$ 97,225,600	$ 21,657,600		$ 118,883,200
Excavate Waste/Segregate/Size Material Down Time (50 days/yr)		800	DAY		800	DAY	30,383	$ 24,306,400	$ -		$ 24,306,400
Operations Costs of Retrieval Process-Buildings		192	MO	$ 130,208	NA				$ 24,999,936		$ 24,999,936
Building Maintenance/Repairs (10-percent of Operations)		16	YR	$ 156,250	NA				$ 2,499,994		$ 2,499,994
Equipment Maintenance/Repairs (10-percent of Operations)		3,200	DAY	$ 3,715	NA				$ 11,888,320		$ 11,888,320
Backfill Excavations w/Clean Soil in Trenches		507,000	CY	$ 9	NA				$ 4,309,500		$ 4,309,500
LAG STORAGE OPERATIONS											
NDA for TRU Separation Instrumentation		1	LS	$ 750,000	NA				$ 750,000		$ 750,000
Facility operation		3,200	DAY	$ 3,000	3,200	DAY	5,300	$ 16,960,000	$ 9,600,000		$ 26,560,000
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	10,920,807	$ 10,920,807			$ 10,920,807
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 5,371,329	$ 5,371,329
Subtotal											**$ 273,938,000**
EX SITU TREATMENT, PROCESSING, REPACKAGING											
Equipment/Materials - Common Area											
Assay Equipment - SGCS (2.1 CY/HR)		1	EA	$ 1,500,000	NA				$ 1,500,000		$ 1,500,000
Assay Equipment - Box/Drum Counter (1.2 CY/HR)		1	EA	$ 4,500,000	NA				$ 4,500,000		$ 4,500,000
Waste Separation System (3.3 CY/HR)		1	EA	$ 3,500,000	NA				$ 3,500,000		$ 3,500,000
Construction/Operations											
Capital Equipment Delivery/Erection/Installation		1	LS	$ 4,700,000	NA				$ 4,700,000		$ 4,700,000
Pre-Operational Testing/Technology Verification		1	LS	$ 6,374,806	NA				$ 6,374,806		$ 6,374,806
TRU Processing Facility											
Equipment/Materials											
Stainless Steel Drums for TRUPACT		265,000	EA	$ 275	NA				$ 72,875,000		$ 72,875,000
Super Compactor		1	EA	$ 1,000,000	NA				$ 1,000,000		$ 1,000,000

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE
(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7. FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
Non-TRU (LLW) Processing											
Equipment/Materials											
Shredder System (550 LB/HR)		1	EA	$ 800,000	NA				$ 800,000		$ 800,000
Steam Reforming System (2,000 LB/HR)		1	EA	$ 12,000,000	NA				$ 12,000,000		$ 12,000,000
Off-Gas System (2,500 ACFM/MIN), to Include:		2	EA	$ 2,900,000	NA				$ 5,800,000		$ 5,800,000
Quencher, Venturi Scrubber, Packed Bed Scrubber, Demister											
Reheater, Parallel HEPA Filters, Parallel Off-Gas Fans, After Burner											
Secondary Liquid Waste System (Brine)		1	EA	$ 5,200,000	NA				$ 5,200,000		$ 5,200,000
Solidification System (100 drums/day) (Pugmill)		1	EA	$ 11,900,000	NA				$ 11,900,000		$ 11,900,000
Drum Assay System (100 drums/day)		8	EA	$ 1,800,000	NA				$ 14,400,000		$ 14,400,000
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 3,469,195	$ 3,469,195			$ 3,469,195
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 2,960,380	$ 2,960,380
Subtotal											**$ 150,979,000**
Operation (Proportionately Scaled from AMWTF)											
Pre-Operational System Testing		NA			1	LS	$ 38,234,403	$ 38,234,403			$ 38,234,403
Testing as Required by Federal and State Regulators		NA			1	LS	$ 19,117,202	$ 19,117,202			$ 19,117,202
Annual Estimated Operational Costs (FY 2019)		NA			1	YR	$ 9,690,000	$ 9,690,000			$ 9,690,000
Annual Estimated Operational Costs (FY 2020)		NA			1	YR	$ 29,529,000	$ 29,529,000			$ 29,529,000
Annual Estimated Operational Costs (FY 2021)		NA			1	YR	$ 42,500,000	$ 42,500,000			$ 42,500,000
Annual Estimated Operational Costs (FY 2022)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2023)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2024)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2025)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2026)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2027)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2028)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2029)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2030)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2031)		NA			1	YR	$ 56,100,000	$ 56,100,000			$ 56,100,000
Annual Estimated Operational Costs (FY 2032)		NA			1	YR	$ 29,529,000	$ 29,529,000			$ 29,529,000
Annual Estimated Operational Costs (FY 2033)		NA			1	YR	$ 20,910,000	$ 20,910,000			$ 20,910,000
Annual Estimated Operational Costs (FY 2034)		NA			1	YR	$ 20,910,000	$ 20,910,000			$ 20,910,000
RCRA Closure of Treatment Facilities		NA			1	LS	$ 16,780,000	$ 16,780,000			$ 16,780,000
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 15,763,992	$ 15,763,992
Subtotal											**$ 803,984,000**

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

	DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
	ON-SITE TRANSPORTATION AND DISPOSAL											
	Equipment/Materials											
	Soil for use During Waste Placement		42,750	CY	$ 5	NA				$ 203,918		$ 203,918
	Truck to Transport Waste		1	LS	$ 175,000	NA				$ 175,000		$ 175,000
	Transportation Costs		192	MO	$ 2,380	NA				$ 456,960		$ 456,960
	Containers for Disposal		50,000	EA	$ 125	NA				$ 6,250,000		$ 6,250,000
	Construction/Operations											
	Transport to on-Site Landfill		200,000	CY	$ 5	NA				$ 954,000		$ 954,000
	Waste Placement/Compaction		250,000	CY	$ 38	NA				$ 9,520,000		$ 9,520,000
	Surfactants/Dust Suppression		16	YR	$ 125,000	NA				$ 2,000,000		$ 2,000,000
	Decommission Evaporation Ponds/Haul to Land Fill		8,000	CY	$ 105	NA				$ 840,000		$ 840,000
	OFF-SITE TRANSPORTATION AND DISPOSAL AT WIPP											
	Transport TRU Waste to WIPP (Not Included)		NA									
	Disposal Costs at WIPP (Not Included)		NA									
	Drum Characterization for Transport to WIPP		265,000	EA	$ 1,500	NA				$ 397,500,000		$ 397,500,000
	INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 489,597	$ 489,597			$ 489,597
	Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 8,367,789	$ 8,367,789
	Subtotal											**$ 426,757,000**
	SURFACE BARRIER											
	PRE-CONSTRUCTION ACTIVITIES											
	Borrow Source Site Investigation		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
	Spreading Area "B" 404 Permit Application (6-months)		1	LS	$ 200,000	NA				$ 200,000		$ 200,000
	Surface Water Controls/Soil Erosion Sediment Control Features		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
	Site Preparation: Clear, Grub & Grade		113	AC	$ 3,800	NA				$ 429,400		$ 429,400
	Construct 2-mile Haul Road from Borrow to Site (Stone Road)		2	MI	$ 500,000	NA				$ 1,000,000		$ 1,000,000
	Install/Develop GW Wells for Compaction Water		3	EA	$ 250,000	NA				$ 750,000		$ 750,000
	Subtotal											**$ 2,879,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7. FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
CONSTRUCTION - MODIFIED RCRA SUBTITLE C COVER											
Pea Gravel Admixture with Topsoil 20-inches		264,000	CCY	$ 6	NA				$ 1,581,360		$ 1,581,360
Compacted Silt Loam (Topsoil) 20-inches		264,000	CCY	$ 5	NA				$ 1,259,280		$ 1,259,280
Sand Filter Layer 6-inches		79,000	CCY	$ 25	NA				$ 1,975,000		$ 1,975,000
Gravel Filter Layer 6-inches		79,000	CCY	$ 10	NA				$ 790,000		$ 790,000
Lateral Drainage Layer 6-inches		79,000	CCY	$ 10	NA				$ 790,000		$ 790,000
Low-Perm Asphalt 6-inches		79,000	CCY	$ 19	NA				$ 1,461,500		$ 1,461,500
Asphalt Base Course 4-inches		53,000	CCY	$ 19	NA				$ 980,500		$ 980,500
Gravel Gas Collection Layer, 6-inches		79,000	CCY	$ 10	NA				$ 790,000		$ 790,000
Fine Filter - Sideslopes, 12-inches		6,000	CCY	$ 25	NA				$ 150,000		$ 150,000
Coarse Filter - Sideslopes, 12-inches		6,000	CCY	$ 10	NA				$ 60,000		$ 60,000
Sideslope Rip-Rap 12-inches		6,000	CCY	$ 40	NA				$ 240,000		$ 240,000
Rip-Rap, Sideslope , 36-inches		18,000	CCY	$ 40	NA				$ 720,000		$ 720,000
Grading Fill, 10-ft Thick Average (Less post ISG decon fill)		1,564,000	CCY	$ 5	NA				$ 7,460,280		$ 7,460,280
Perimeter Berm		244,200	CCY	$ 5	NA				$ 1,164,834		$ 1,164,834
Install (37) New Lysimeters and Cap Penetrations		37	EA	$ 131,756	NA				$ 4,874,972		$ 4,874,972
OCVZ System Relocation/Well Extension		1	LS	$ 300,000	NA				$ 300,000		$ 300,000
Lab Geotechnical Testing/Compaction		40	MO	$ 50,000	NA				$ 2,000,000		$ 2,000,000
Filed Geotechnical Testing/Compaction		40	MO	$ 90,000	NA				$ 3,600,000		$ 3,600,000
Surveying/Grade Control		40	MO	$ 65,000	NA				$ 2,600,000		$ 2,600,000
Third-Party Independent CQA Testing/Certification		40	MO	$ 75,000	NA				$ 3,000,000		$ 3,000,000
									$ -		$ -
Hydroseeding/Mulching (Re-seeding Included)		113	AC	$ 2,750	NA				$ 310,750		$ 310,750
Seasonal Shutdown/Re-Mobilization		3	EA	$ 500,000	NA				$ 1,500,000		$ 1,500,000
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 779,758	NA				$ 779,758		$ 779,758
INEEL Site-Specific Training/Work Order Requirements		NA			1	LS	$ 990,423	$ 990,423			$ 990,423
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 845,161	$ 845,161
Pre-Final Inspection Report, Phase I					1	LS	$ 250,000	$ 250,000			$ 250,000
Subtotal											**$ 40,474,000**
Landfill Cover											
Topsoil , 1-ft		19,400	CCY	$ 6	NA				$ 116,206		$ 116,206
Sand Filter Layer, 1-ft Thick		19,400	CCY	$ 25	NA				$ 485,000		$ 485,000
Gravel Filter Layer, 1-ft Thick		19,400	CCY	$ 10	NA				$ 194,000		$ 194,000
Biotic Barrier Layer - 2.5-ft Thick		48,400	CCY	$ 50	NA				$ 2,420,000		$ 2,420,000
Gravel Gas Collection, 0.5-ft Thick		9,700	CCY	$ 10	NA				$ 97,000		$ 97,000
Compacted Clay Liner		38,800	CCY	$ 12	NA				$ 465,988		$ 465,988
Gravel Filter Layer, 1-ft Thick		19,400	CCY	$ 10	NA				$ 194,000		$ 194,000
Sand Filter Layer, 1-ft Thick		19,400	CCY	$ 25	NA				$ 485,000		$ 485,000
HDPE Geomembrane		58,100	SY	$ 6	NA				$ 319,550		$ 319,550
Engineered Earth Fill, 8-ft Thick		154,800	CCY	$ 5	NA				$ 738,396		$ 738,396
Hydroseeding/Mulching (Re-seeding Included)		12	AC	$ 2,750	NA				$ 33,000		$ 33,000
Lab Geotechnical Testing (Gradation, hardness, density)		10	MO	$ 50,000	NA				$ 500,000		$ 500,000
Filed Geotechnical Testing (Density)		10	MO	$ 90,000	NA				$ 900,000		$ 900,000
Surveying/Grade Control		10	MO	$ 65,000	NA				$ 650,000		$ 650,000
Third-Party Independent CQA Testing/Certification		10	MO	$ 75,000	NA				$ 750,000		$ 750,000
Seasonal Shutdown/Re-Mobilization		1	EA	$ 500,000	NA				$ 500,000		$ 500,000
Mobilization and Demobilization	2.0%	1	LS	$ 166,963	NA				$ 166,963		$ 166,963
INEEL Site-Specific Training/Work Order Requirements					1	LS	$ 216,362.47	$ 216,362.47			$ 216,362
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 184,629	$ 184,629
Pre-Final Inspection Report, Phase 2		NA			1	LS	$ 125,000.00	$ 125,000.00			$ 125,000
Subtotal											**$ 9,541,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

	DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
	Subtotal Subcontractor Directs - Remedial Action											**$ 3,338,927,000**
	Subcontractor Overhead	15.0%										$ 500,839,050
	Subcontractor Profit	10.0%										$ 383,976,605
	TOTAL REMEDIAL ACTION COST											**$ 4,223,743,000**
	TOTAL COST - Remedial Action Contracts											**$ 4,889,950,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE RETRIEVAL, TREATMENT, AND DISPOSAL ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: RETRIEVAL/TREATMENT/DISPOSAL (RTD) ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
POST-REMEDIAL ACTION OPERATIONS (100 YEAR DURATION)											
INSTITUTIONAL CONTROLS FOR 100 YEARS											
Install Permanent Markers/Survey		12	EA	$ 5,000	NA				$ 60,000		$ 60,000.0
Replace Perimeter Security Fence		10,000	LF	$ 20	NA				$ 200,000		$ 200,000.0
Repair and Replace Perimeter Signs		1	LS	$ 10,000	NA				$ 10,000		$ 10,000.0
Subtotal											**$ 270,000**
COVER MAINTENANCE											
Cover Maintenance Cost - 100 Year Duration Annual Cap Maintenance Costs		100	YR	$ 75,000	NA				$ 7,500,000		$ 7,500,000
Subtotal											**$ 7,500,000**
SURVEILLANCE AND MONITORING											
Groundwater Monitoring: (16-wells)											
Groundwater Monitoring, Quarterly for 2 Years - (8-Sampling Events)		8	EVT	$ 1,000	8	EVT	$ 11,000	$ 88,000	$ 8,000	$ 854,936	$ 950,936
Groundwater Monitoring, Semi -Annually for 3 Years - (6-Sampling Events)		6	EVT	$ 1,000	6	EVT	$ 11,000	$ 66,000	$ 6,000	$ 641,202	$ 713,202
Groundwater Monitoring, Annually for 95 Years (95-Sampling Events)		95	EVT	$ 500	95	EVT	$ 5,500	$ 522,500	$ 47,500	$ 5,076,183	$ 5,646,183
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 731,032	NA				$ 731,032		$ 731,032
Vadose Zone Monitoring:											
Sample 37 Lysimeters 1 Time per Year in Late Spring (Initial 5 years)		5	EVT	$ 1,000	100	EVT	$ 17,875	$ 89,375	$ 5,000	$ 133,585	$ 227,960
Sample 37 Lysimeters 1 Time per Year in Late Spring (95 years)		95	EVT	$ 500	100	EVT	$ 8,938	$ 849,063	$ 47,500	$ 1,269,058	$ 2,165,620
Sample & Analyze 20 Vapor Ports 4 Times per Year for 5 Years		20	EVT	$ 1,000	20	EVT	$ 27,500	$ 550,000	$ 20,000	$ 140,000	$ 710,000
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 310,358	NA				$ 310,358		$ 310,358
Surface Water Monitoring:											
Collect Sample from 2 Points 2 Times Every 5 Years (20 Sample Events)		20	EVT	100	20	EVT	$ 1,375.00	$ 27,500.00	$ 2,000	$ 320,660	$ 350,160
Vegetation Monitoring:											
1 Inspection per Year in Early Fall for 5 years		NA			5	EVT	$ 1,100	$ 5,500			$ 5,500
Re-seed 10 Acres Each Year for 5 Years (50 Acres Total)		50	AC	$ 15,000	NA				$ 750,000		$ 750,000
1 Inspection Every 5th Year in Early Fall Thereafter for 95 Years		NA			19	EVT	$ 1,100	$ 20,900			$ 20,900
Re-seed 10 Acres Every 5 Years		19	EVT	$ 15,000	NA				$ 285,000		$ 285,000
Air Monitoring (Radiological/Organic):											
Monitor 4 Existing CAMs		100	EVT	$ 1,000	1	LS	$ 2,200	$ 220,000	$ 100,000	$ 15,300	$ 335,300
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 33,530					$ 33,530		$ 33,530
Perimeter Radiological Monitoring GPS with NaI Detector											
2 People, 1-Time per Year, 2 Days in Summer with Hummer & GPS		100	YR	$ 500	100	YR	$ 2,200	$ 220,000	$ 50,000		$ 270,000
Data Interpretation/Plot Data		100	YR	$ 750	100	YR	$ 2,500	$ 250,000	$ 75,000		$ 325,000
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 59,500	NA				$ 59,500		$ 59,500
Biological Monitoring:											
2 People 2-Times, First 5-Years for Intrusion Monitoring		NA			2	EVT	$ 1,100	$ 2,200			$ 2,200
2 People 1-Time, Every 5th Year thereafter for 95 years		NA			19	EVT	$ 1,100	$ 20,900			$ 20,900
Subtotal											**$ 13,913,000**
Subtotal Surveillance and Monitoring (Sampling & Monitoring Activities)											**$ 21,683,000**
WAG 7 MANAGEMENT											
WAG 7 Management (@ 5% of other post-RA operations costs)	5%				1	LS	$ 1,084,150	$ 1,084,150			$ 1,084,150
Annual Data Summary Report (100 reports @ 200 hrs/report)					20,000	HR	75.00	$ 1,500,000			$ 1,500,000
WAG-Wide RA 5 Year Reviews for 100 Years (20 5-year reviews @ 600 hrs/review)					12,000	HR	$ 75	$ 900,000			$ 900,000
Subtotal											**$ 3,484,150**
TOTAL COST - Post-Remedial Action Operations (100 Year Duration)											**$ 25,167,150**

Attachment D-6

Operable Unit 7-13/14 Feasibility Study Cost Estimate for the Limited Action Alternative

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost estimate are likely to occur as a result of new information and data collected during the engineering design, safety reviews, and remedial alternative. Major changes may be documented in the form of a memorandum in the administrative record file, an explanation of significant differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost.

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE LIMITED ACTION ALTERNATIVE

Project Title:	WAG 7 OU 13/14 Feasibility Study
Estimator:	Brian K. Corb
Date:	December 2002
Estimate Type:	Planning
Reviewed/Appr.:	Lee Lindig/Bruce L. Stevens

I. SCOPE OF WORK:

A. Remedial Design and Remedial Action

Constructing the Limited Action alternative will be implemented in two phases because a portion of the SDA is currently active and receiving waste material. Phase 1 will cover the inactive portion of the site (105 acres) and Phase 2 will cover the active portion of the site (5 acres) after disposal operations are completed in 2020. Constructing the Limited Action alternative includes preconstruction activities, placing earthen fill, and placing gravel, coarse fractured basalt, and riprap layers. Preconstruction activities will include investigating borrow sources, preparing final design, completing a readiness assessment, and mobilizing.

B. Long-Term Monitoring and Maintenance

After the Remedial Action has been completed, long-term monitoring and maintenance will continue for 100 years, with CERCLA reviews conducted every 5 years. The long-term environmental monitoring will be conducted for groundwater, vadose zone water, surface water, and air. In addition, the biotic barrier itself will be monitored annually during the first 5 years following completion of construction. After that, monitoring will be reduced to every 5 years concurrent with the 5-year reviews required under CERCLA. The biotic barrier will be monitored for damage from erosion and differential settlement. Areas of erosion and settlement damage will be repaired with additional earthen fill, gravel, coarse fractured basalt, or riprap as needed to maintain barrier integrity.

II. BASIS OF ESTIMATE:

The basis of the estimate was developed from the following sources to provide a defensible and comparative cost of the remedial alternatives. The applicable sources available for the Limited Action alternative include:

A. EPA, "A Guide to Developing and Documenting Cost Estimates During Feasibility Study," July 2000

B. INEEL, "Cost Estimating Guide," DOE/ID-10473, 2000

C. "Environmental Assessment and Plan for New Silt/Clay Source Development and Use at the Idaho National Engineering and Environmental Laboratory," DOE/EA-1083, May 1997

D. *Caterpillar Equipment Performance Handbook*, 31st Edition

E. The INEEL Site Stabilization Agreement, Union Labor Agreement

F. Facilities Unit Costs—Military Construction, PAX Newsletter No. 3.2.2—10, March 2000

G. ICDF Construction Cost Estimate, Cap Construction Cost (CH2MHILL, December 2000)

H. Subject Matter Experts—M. Jackson, BBWI, and T. Borschel, BBWI, "Availability of Borrow Source Material at the INEEL"

I. BBWI, "INEEL Site Craft and Professional Services Labor Rates," February 2002

J. OMB, 2002, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," Appendix C, "Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses," OMB Circular A-94, February 2002.

K. R. S. Means, 2002, *Heavy Construction and Industrial Building Unit Costs Data* 16th edition, Kingston, Massachusetts.

L. INEEL, "Analytical Laboratory Unit Costs."

III. ASSUMPTIONS:

The primary work associated with the Limited Action alternative includes placing earthen fill, gravel, coarse fractured basalt, and riprap over the SDA. Because some portions of the SDA will continue operating until 2020, the biotic barrier construction effort is divided into two phases. Phase 1 includes placing the biotic barrier over approximately 105 acres of inactive portions of the SDA. Phase 2 includes placing the biotic barrier over an estimated 5 acres of the SDA that will remain active until 2020. Specific elements of the work and important assumptions are provided below:

A. Management and Oversight

A.1 Project Management for the BBWI oversight of this alternative has been estimated based on an average classification of job categories using the BBWI rates. The number of FTEs are based on 2,000 MH per person per year.

A.2 The RD/RA schedule assumes that budgetary funding will not be constrained.

A.3 The RD/RA schedule assumes no unexpected delays will result from changes to the USQ/SAR process.

A.4 The estimate assumes that INEEL site resources (i.e., CFA, medical facilities, geotechnical lab, fire department, security, utilities at the SDA) will be available for the duration.

B. Design and Preconstruction

B.1 Preconstruction activities—Borrow source investigations, cultural resource clearance, developing an onsite source of basalt rock, final design, readiness assessment completion, and mobilizing.

C. Site Preparation and Support Activities and Facilities

C.1 Placing earthen fill—Site clearing, grubbing, and leveling will be followed by placing a site-grading fill (averaging 7-ft thick over the SDA) to facilitate positive perimeter drainage.

C.2 It is assumed that after grading fill placement has been completed, heavy equipment operation can commence without any ground subsidence. No additional cost for cribbing or temporary road stabilization is included in the estimate.

C.3 The capital cost for the project includes relocating the existing OCVZ extraction and treatment units, and extending the well casings through the biotic barrier.

D. Borrow Areas

D.1 Spreading Area B will be available and will not be flooded. No additional costs have been provided to dewater Spreading Area B.

D.2 Adequate quantity and quality of borrow source material is available from Spreading Area B, the Borax Pit, and the Basalt Source (for riprap and coarse fractured basalt). Furthermore, no royalty fee or earthen material costs are provided for in the estimate.

D.3 An adequate water source will be available to support the earthmoving and soil moisture conditioning for placement and compaction based on the equipment productivities assumed for this estimate.

E. Biotic Barrier Construction

E.1 Placing gravel, coarse fractured basalt, and riprap—Placing a 1-ft-thick gravel layer over earth fill, a 3-ft-thick layer of coarse fractured basalt over gravel, a 1-ft-thick layer of gravel over coarse fractured basalt, and a 3-ft-thick layer of riprap over gravel.

F. Capital Costs, Unit Rates, and other Pricing Assumptions

F.1 The unit prices have been developed from a crew build-up to process, load, haul, place, and compact. The volume of material represented in the cost tables identifies CCY. The appropriate factors convert the estimated unit material weights (bank, loose, and fill) and are factored into the equipment productivity.

F.2 Crew labor rates were developed based on hourly rates stipulated in the INEEL Site Stabilization Agreement. Labor and equipment spreads were developed based on the assumed achievable daily productivity. Other factors that influenced the selection of labor and equipment quantities include safety, level of PPE of the work to be performed, haul routes, and availability of resources on the INEEL. Each daily crew cost also includes field oversight personnel (e.g., HSO, superintendents, foremen, CIH, and maintenance personnel) and supplies (e.g., fuel, oil, grease, and spare parts).

F.3 Primarily all capital equipment and pricing were selected from commercially available sources or similar projects allowing a scale factor to be applied to yield an estimated cost of the conceptual equipment and operational requirements. Equipment installation is considered to be a significant cost variable in estimating individual components of a given system. The installation cost of the capital equipment was based on a percentage of capital costs ranging from 110 to 160% of the estimated capital expenditure, based on the unknowns and level of complexity.

F.4 Subcontractors' bond and insurance rate of 2% of the total subcontractor dollars includes overhead and profit based on each alternative.

F.5 The estimate includes an allocation for the INEEL specific work order PRD requirements and safety meetings. Because this estimate includes primarily unit prices, the labor cost is estimated to be 40% of the unit prices and, based on historical data, cost of the INEEL-specific process is approximately 6% of the total labor dollars.

G. Schedule

G.1 The estimate assumes that earthwork operations can be performed for 10 months per year without weather impacts. The work will be performed working two 10-hour shifts, with a back shift working 5 days per week to perform maintenance.

G.2 The estimate assumes that the field crews will demobilize equipment during the 2-month winter shutdown to refurbish and replace the equipment. The estimate includes an allocation to cover these costs in addition to the 2% estimated.

H. Health and Safety

H.1 It is assumed that the after the initial site grading material is placed over the SDA, all earthmoving operations can be performed in Level D.

I. Long-term Operating and Maintenance and Monitoring

I.1 The capital cost for the project includes replacing and reinstalling 37 existing lysimeters. The estimate assumes that lysimeters will be installed at varying depths of 20, 90, 200, and 600 ft along the interbed surfaces.

I.2 The lysimeter analytical cost assumes that liquid samples will be recovered in 10% of the wells. Therefore, analytical costs are included only for the assumed number of recoverable samples.

I.3 Ongoing maintenance of the biotic barrier will be required in perpetuity after construction is completed. It is assumed that frequent maintenance will be required during the years immediately following construction to repair damage from erosion. In addition, the added weight of the biotic barrier is expected to result in increased settlement during the initial years following construction. Some areas of the biotic barrier will require ongoing maintenance to repair damage resulting from settlement. It is expected that annual maintenance and repairs will be required during the first 5 years following construction. Ongoing maintenance and repairs will continue every 5 years concurrent with the 5-year review process.

J. Design Costs

The following discussion provides the basis for the assumed percentage for design, construction, and contingency. EPA provides guidance for estimating remedial design costs in the EPA Guidance. Exhibit 5-8 of the EPA Guidance provides examples of remedial design costs as a percentage of total capital costs. The percentages range from 20% for projects with capital costs less than $100,000 to 6% for projects with capital costs greater than $10 million. The EPA Guidance does not provide an example of design costs that vary according to the complexity of technologies.

The alternatives include technologies that have been demonstrated on other sites and have well developed engineering design criteria (e.g., capping) and technologies that have not been demonstrated on a large scale and require development of engineering design criteria (e.g., ISV). Remedial design costs are expected to vary significantly according to the degree of complexity and the estimated costs for remedial design needed to reflect the varying degrees of complexity. Based on the complexity of the technology application, a percentage of capital and operating cost specific to the technology was assumed.

The biotic barrier system has been demonstrated on other sites, and design standards have been developed for various materials and construction methods. Some borrow source investigations will be needed to verify material properties and quantities, but the methods for conducting these investigations are not expected to require specialized equipment or personnel. Because capping for the biotic barrier is a demonstrated technology with established design standards, the cost for remedial design is assumed to be 6% of capital costs.

K. Construction Management Costs

Cost considerations for BBWI oversight, regulatory agency interaction, and project management were estimated on a representative basis of an assumed level of effort required to implement the selected alternative. Additionally, estimated costs for the remedial design, safety equipment and PPE, construction management, general conditions, and insurance and bonds were included to capture a relative basis for cost comparison and to identify other costs associated with implementing a given remedial alternative.

The percentage is based on total capital construction cost to implement the alternative. The percentage basis assumed for each category identified was selected considering the complexity of the alternative and risk and uncertainty of the approach. The cost identified under the category general conditions includes administration buildings, parking area, utilities, and support infrastructure to facilitate the remedial alternative.

L. Contingency Costs

The EPA provides guidance for estimating contingency costs in the EPA Guidance, which distinguishes between scope contingency and bid contingency costs. Scope contingency costs represent risks associated with incomplete design and include factors such as limited experience with technologies, additional requirements because of regulatory or policy changes, and inaccuracies in defining quantities or characteristics. Exhibit 5-6 of the EPA Guidance provides examples of scope contingencies. Bid contingency costs are unknown costs at the time of estimate preparation that become known as remedial action construction or O&M proceeds. Bid contingencies represent reserves for quantity overruns, modifications, change orders, and claims during construction. The EPA Guidance states that bid contingencies may be added to construction and O&M costs and typically range from 10 to 20%.

Because EPA Guidance suggests that contingency costs will vary according to the alternative technologies, it is necessary to estimate varying contingency costs for the technologies included in the alternatives. Biotic barrier technology includes placing earthen fill, gravel, and armor (fractured basalt and riprap) over the SDA to prevent access to waste materials. Constructing an infiltration barrier using synthetic materials is not included as part of this technology. The only risk related to scope and bid contingencies associated with this technology is the ability to locate and permit borrow sources for biotic barrier materials. Biotic barrier technology is assumed to require a scope contingency for a clay cap listed in Table 1 (5 to 10%). Because of the low risk associated with this technology, the costs for scope and bid contingencies would be 10% each for a total contingency of 20% of capital costs.

IV. SCHEDULE:

The following activities comprise the RD/RA portion the Limited Action alternative. The corresponding durations are based on the estimated crew productivity, regulatory reviews and approvals, and weather constraints inherent to the INEEL site. They are presented in Tables 2 and 3.

V. PRESENT WORTH ANALYSIS:

Guidance for present value analysis is provided in Chapter 4 of the EPA Guidance, which states that the present value analysis of a remedial alternative involves four basic steps:

1. Define the period of analysis
2. Calculate the cash outflows (payments) for each project year
3. Select a discount rate to use in the present value calculation
4. Calculate the present value.

Periods of analysis for the Limited Action alternative include Phase 1 design and construction, Phase 2 design and construction, and O&M. Phase 1 is estimated to last 6 years, beginning shortly after issuance of a ROD for the site. Phase 2 is estimated to last 2 years beginning shortly after currently active areas of the site are closed in 2020. O&M will begin toward the end of the vegetation establishment period for Phase 1 construction and will continue for 100 years.

Cash outflows for the Limited Action alternative will include payments for design and construction, periodic payments for major repairs, and annual O&M costs. EPA Guidance suggests that most capital costs occur in the first year of remedial action. While this suggestion might be realistic for short-duration remedial actions, it is not a realistic assumption for the Limited Action alternative because of the time required for design and construction. Cash outflows for the Limited Action alternative would be paid on an annual basis as costs are incurred, beginning with the borrow source investigation and remedial design and ending with riprap placement for Phase 1 and Phase 2 construction.

Annual capital cost payments vary with the level of activity with relatively low annual payments during the borrow source investigation, remedial design, and readiness assessment and relatively high annual payments during heavy construction periods (material excavation, processing, stockpiling, and placement). Periodic costs for major repairs would occur every 5 years, concurrent with the 5-year reviews required by CERCLA. Periodic costs would begin 5 years after Phase 1 construction and continue through the O&M period. Annual O&M costs would begin the first year after completion of Phase 1 and continue for 100 years. In accordance with EPA Guidance requirements, 2002 constant dollars are used for all annual and periodic cash outflows.

EPA Guidance requires using a real discount rate that approximates the marginal pretax rate of return on an average investment and has been adjusted to eliminate the effect of expected inflation. The real discount rate must be used with constant or real dollars that have not been adjusted for inflation. EPA Guidance recommends using a 7% real discount rate for present value analysis in most remedial action cost estimates. However, for federal facility sites being cleaned up using Superfund authority, EPA Guidance states that it is appropriate to apply the real discount rates found in Appendix C of OMB Circular A-94. Suggested rates for federal facility sites are based on interest rates from Treasury notes and bonds and are appropriate because the federal government has a different cost of capital than the private sector. The most current version of Appendix C of OMB Circular A-94 (revised February 2002) proposes a real discount rate of 3.9% for programs lasting longer than 30 years. The 3.9% discount rate and constant dollars are used for the present value analysis of the Limited Action alternative. The present value of the Limited Action alternative is calculated using the equations provided in EPA Guidance.

VI. RISK AND UNCERTAINTY:

Because the primary construction activity associated with the Limited Action alternative is excavation, hauling, and placing large quantities of borrow material, the highest risk for this alternative is losing of a primary borrow source located close to the site. Increased haul distances could result in a significant increase in the construction schedule and the cost of materials. The primary materials needed for the biotic barrier are silt loam and mined and processed basalt. For this alternative, it is assumed that sufficient quantities of silt loam will be available from Spreading Area B, located very near the site. If this source is lacking in capacity or otherwise unavailable, the nearest alternative sources are the Ryegrass Flats and WRRTF borrow areas. Ryegrass Flats is 12 mi from the site and the WRRTF borrow area is 34 mi. The haul distance from Spreading Area B is 1.5 mi. Mined and processed basalt is assumed to be available from a basalt outcrop located 5 mi from the site. If Spreading Area B is not available for excavation or the basalt outcrop is not available for mining, other sources more distant from the site would need to be developed at greater cost.

An additional assumption related to borrow sources is that coarse fractured basalt may be substituted for cobbles as part of the biotic barrier. If this substitution is not allowed and cobbles must be used, cobbles would need to be obtained from Idaho Falls, about 45 mi from the site. The required using cobbles would result in significant increases in costs and time.

VII. ESTIMATED MATERIAL VOLUME TABLES:

Tables 4 and 5 summarize required materials for the Limited Action alternative and related design layers, thickness, and volume.

VIII. TABLES:

Table 1. Example feasibility study-level scope contingency percentages.

Remedial Technology	Scope Contingency (%)
Soil excavation	15 to 55
Synthetic cap	10 to 20
Clay cap	5 to 10
Surface grading and diking	5 to 10
Revegetation	5 to 10

Table 2. Phase 1—design and construction.

Activity Description	Estimated Duration
Borrow source investigation	1 year
Remedial design and procurement	1.0 year (overlaps borrow source inv. by 0.5 year)
Readiness assessment	0.5 year (no overlap with design)
Mobilization	0.5 year (no overlap with readiness assessment)
Earthen fill placement	2 years (no overlap with readiness assessment)
Gravel placement	0.5 year (overlaps earthen fill by 0.5 year)
Coarse fractured basalt placement	1 year (no overlap with gravel placement)
Gravel placement	0.5 year (overlaps basalt placement by 0.5 year)
Riprap placement	1 year (no overlap with gravel placement)

Table 3. Phase 2—Design and construction.

Activity Description	Estimated Duration
Remedial design and procurement	1 year assumed
Readiness assessment	1 year (no overlap with design)
Mobilization	0.5 year (no overlap with readiness assessment)
Placement of all biotic barrier layers	1 year (no overlap with mobilization)

Table 4. Distances and sources of borrow materials for the modified RCRA Subtitle C cover system.

Material	Issue	One-Way Haul Distance	Source
Silt loam	This material would be used to construct the earthen fill layer of the barrier.	1.5 mi	This material is expected to be unprocessed silt loam derived from Spreading Area B. Additional material is available from Ryegrass Flats (haul distance = 12 mi) and WRRTF borrow area (haul distance = 34 mi).
Gravel	This material would be used for the gravel layers within the barrier. Sufficient quantities of good structural gravel are available.	2.5 mi	This material is assumed to be unprocessed gravel derived from the Borax Gravel Pit.
Riprap	Riprap would be used on the surface of the barrier. The majority of the mined riprap material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.
Coarse fractured basalt	This material would be used between the gravel layers of the barrier. The majority of the mined coarse fractured basalt material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.
Cobbles	This material would be used between the gravel layers of the barrier if coarse fractured basalt is not available or is not allowed for such use. No identified borrow areas are within the INEEL boundary.	45 mi	This material is assumed to be processed material transported to the INEEL from Idaho Falls.

RWMC = Radioactive Waste Management Complex
WRRTF = Water Reactor Research Test Facility

Table 5. Biotic barrier design layers, thickness, and volume.

Layer	Thickness	Approximate Volume[a]	Material Description
Phase 1—Construction (105 acres)			
Riprap	36 in.	508,200 CCY	Processed basalt mined from an INEEL site.
Gravel	12 in.	169,400 CCY	Unprocessed gravel from the Borax Gravel Pit.
Coarse basalt	36 in.	508,200 CCY	Processed basalt mined from an INEEL site.
Gravel	12 in.	169,400 CCY	Unprocessed gravel from the Borax Gravel Pit.
Earthen fill	84 in.	1,185,800 CCY	Unprocessed silt loam from Spreading Area B.
Perimeter berm	NA	244,200 CCY	Unprocessed silt loam from Spreading Area A; berm average 6-ft high; 100-ft wide; 10,000-ft perimeter; 2H:1V side slopes.
Phase 2 —Construction (5 acres)			
Riprap	36 in.	24,200 CCY	Processed basalt mined from an INEEL site.
Gravel	12 in.	8,100 CCY	Unprocessed gravel from the Borax Gravel Pit.
Coarse basalt	36 in.	24,200 CCY	Processed basalt mined from an INEEL site.
Gravel	12 in.	8,100 CCY	Unprocessed gravel from the Borax Gravel Pit.
Earthen fill	84 in.	56,500 CCY	Unprocessed silt loam from Spreading Area B.

a. This table provides estimated in-place volumes rounded to the nearest 100 CCY.
CCY = compacted cubic yard
INEEL = Idaho National Engineering and Environmental Laboratory
NA = not applicable

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE LIMITED ACTION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: LIMITED ACTION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/24/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
FFA/CO MANAGEMENT AND OVERSIGHT											
WAG 7 Management (8-Years)											
Coordination/Oversight Tech Support (E28) - 1.0 FTE/YR		NA			16,000	HR	$ 93	$ 1,483,520			$ 1,483,520
Coordination with Agency Participants (E28) - 0.5 FTE/YR		NA			8,000	HR	$ 93	$ 741,760			$ 741,760
Environmental Engineering (E08) - 1.0 FTE/YR		NA			16,000	HR	$ 76	$ 1,210,720			$ 1,210,720
Cost and Schedule Control (F10) - 2.0 FTE/YR		NA			32,000	HR	$ 59	$ 1,884,480			$ 1,884,480
Regulatory Compliance (S11) - 1.0 FTE/YR		NA			16,000	HR	$ 79	$ 1,264,160			$ 1,264,160
Quarterly and Annual Reviews (S21) - 1.0 FTE/YR		NA			16,000	HR	$ 73	$ 1,162,880			$ 1,162,880
Audit Preparation and Coordination (S11) - 0.5 FTE/YR		NA			8,000	HR	$ 79	$ 632,080			$ 632,080
Health and Safety Coordination/Training (S08) - 2.0 FTE/YR		NA			32,000	HR	$ 62	$ 1,994,240			$ 1,994,240
Annual O&M Reports (S15) - 0.5 FTE/YR		NA			8,000	HR	$ 79	$ 628,320			$ 628,320
Attorney/Legal Fees, 0.3 FTE/YR		NA			4,800	HR	$ 150	$ 720,000			$ 720,000
Allocation for Other Direct Costs (ODCs) - 10% of Total Labor		NA			1	LS	$ 1,100,216	$ 1,100,216			$ 1,100,216
TOTAL COST - FFA/CO Management and Oversight											$ 12,822,000
Construction Management											
Construction Management (@ 6% of Phase 1 & 2 RA Costs)	6%	NA			1	LS	$ 5,573,160	$ 5,573,160			$ 5,573,160
General Conditions (@ 1.25% of Phase 1 & 2 RA Costs)	1.25%	NA			1	LS	$ 1,161,075	$ 1,161,075			$ 1,161,075
Health and Safety Equipment Allocation (@ 0.25% of Phase 1 & 2 RA Costs)	0.25%	NA			1	LS	$ 232,215	$ 232,215			$ 232,215
Medical Monitoring/Surveillance/Air Monitoring (@ 0.10% of Phase 1 & 2 RA Costs)	0.10%	NA			1	LS	$ 92,886	$ 92,886			$ 92,886
TOTAL COST - Construction Management											$ 7,059,000
REMEDIAL DESIGN AND REMEDIAL ACTION PLANS/REPORTS											
Biotic Barrier RD/RA Workplan (@ 6% of Phase 1 & 2 Construction)	6%	NA			1	LS	$ 4,405,680	$ 4,405,680			$ 4,405,680
Readiness Assessment (@ 1.5% of Construction)	1.5%	NA			1	LS	$ 1,393,290	$ 1,393,290			$ 1,393,290
Remedial Action Report		NA			3,000	HR	$ 76	$ 227,010			$ 227,010
TOTAL COST - Remedial Design											$ 6,026,000

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE LIMITED ACTION ALTERNATIVE

(continued).

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PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
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BIOTIC BARRIER - PHASE 1											
PRE-CONSTRUCTION ACTIVITIES											
Borrow Source Site Investigation		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
Surface Water Controls/Soil Erosion Sediment Control Features		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
Spreading Area "B" 404 Permit Application (6-months)		1	LS	$ 200,000	NA				$ 200,000		$ 200,000
Site Preparation: Clear, Grub & Grade		125	AC	$ 3,800	NA				$ 475,000		$ 475,000
Construct 2-mile Haul Road from Borrow to Site (Stone Road)		2	MI	$ 500,000	NA				$ 1,000,000		$ 1,000,000
Subtotal											**$ 2,175,000**
CONSTRUCTION											
Rip-Rap Layer - 3-ft Thick		508,200	CCY	$ 15	NA				$ 7,506,114		$ 7,506,114
Gravel Layer - 1.0-ft Thick		169,400	CCY	$ 10	NA				$ 1,694,000		$ 1,694,000
Coarse Fractured Basalt Layer - Sideslope of Surface Barrier, 3-ft		508,200	CCY	$ 50	NA				$ 25,410,000		$ 25,410,000
Gravel Filter Layer, 1-ft Thick		169,400	CCY	$ 10	NA				$ 1,694,000		$ 1,694,000
Engineered Earth Fill - 7-ft Thick Average		1,185,800	CCY	$ 5	NA				$ 5,656,266		$ 5,656,266
Perimeter Berm		244,200	CCY	$ 5	NA				$ 1,164,834		$ 1,164,834
Install (37) New Lysimeters and Cap Penetrations		37	EA	$ 131,756	NA				$ 4,874,972		$ 4,874,972
OCVZ System Relocation/Well Extension		1	LS	$ 300,000	NA				$ 300,000		$ 300,000
Lab Geotechnical Testing (Gradation, hardness, density)		40	MO	$ 50,000	NA				$ 2,000,000		$ 2,000,000
Filed Geotechnical Testing (Density)		40	MO	$ 90,000	NA				$ 3,600,000		$ 3,600,000
Surveying/Grade Control		40	MO	$ 65,000	NA				$ 2,600,000		$ 2,600,000
Third-Party Independent CQA Testing/Certification		40	MO	$ 75,000	NA				$ 3,000,000		$ 3,000,000
Seasonal Shutdown/Re-Mobilization		3	EA	$ 500,000	NA				$ 1,500,000		$ 1,500,000
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 1,233,504	NA				$ 1,233,504		$ 1,233,504
INEEL Site-Specific Training/Work Order Requirements	6%				1	LS	$ 1,545,809	$ 1,545,809			$ 1,545,809
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,319,090	$ 1,319,090
Pre-Final Inspection Report, Phase I		NA			1	LS	$ 175,000	$ 175,000			$ 175,000
Subtotal											**$ 65,274,000**
Subtotal Subcontractor Directs - Phase 1 Remedial Action											**$ 67,449,000**
Subcontractor Overhead	15.0%									$ 10,117,350	$ 10,117,350
Subcontractor Profit	10.0%									$ 7,756,635	$ 7,756,635
TOTAL COST - Phase 1 Remedial Action											**$ 85,323,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE LIMITED ACTION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

ROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
UBJECT: LIMITED ACTION ALTERNATIVE
OCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/24/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
BIOTIC BARRIER - PHASE 2											
SITE PREPARATION											
Site Preparation: Clear, Grub & Grade		5	AC	$ 5,400.0	NA				$ 27,000		$ 27,000
Subtotal											**$ 27,000**
CONSTRUCTION											
Rip-Rap Layer - 3-ft Thick		24,200	CCY	$ 15					$ 357,434		$ 357,434
Gravel Layer - 1.0-ft Thick		8,100	CCY	$ 15					$ 118,827		$ 118,827
Coarse Fractured Basalt Layer - Sideslope of Surface Barrier, 3-ft		24,200	CCY	$ 50					$ 1,210,000		$ 1,210,000
Gravel Filter Layer, 1-ft Thick		8,100	CCY	$ 15					$ 118,827		$ 118,827
Engineered Earth Fill - 7-ft Thick Average		56,500	CCY	$ 5					$ 269,505		$ 269,505
Lab Geotechnical Testing (Gradation, hardness, density)		10	MO	$ 50,000					$ 500,000		$ 500,000
Filed Geotechnical Testing (Density)		10	MO	$ 90,000					$ 900,000		$ 900,000
Surveying/Grade Control		10	MO	$ 85,000					$ 850,000		$ 850,000
Third-Party Independent CQA Testing/Certification		10	MO	$ 70,000					$ 700,000		$ 700,000
Seasonal Shutdown/Re-Mobilization		1	EA	$ 500,000					$ 500,000		$ 500,000
Mobilization and Demobilization	2%	1	LS	$ 101,032					$ 101,032		$ 101,032
INEEL Site-Specific Training/Work Order Requirements	6%	NA			1	LS	$ 135,663	$ 135,663			$ 135,663
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 115,766	$ 115,766
Pre-Final Inspection Report, Phase 2		NA			1	LS	$ 75,000	$ 75,000			$ 75,000
Subtotal											**$ 5,952,000**
Subtotal Subcontractor Directs - Phase 2											**$ 5,979,000**
Subcontractor Overhead	15.0%	NA			NA					$ 896,850	$ 896,850
Subcontractor Profit	10.0%	NA			NA					$ 687,585	$ 687,585
TOTAL COST - Phase 2 Remedial Action											**$ 7,563,000**
TOTAL COST - Phase 1 & 2 Remedial Action Contracts											**$ 92,886,000**
TOTAL CAPITAL COSTS											**$ 118,793,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE LIMITED ACTION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: LIMITED ACTION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/24/02

DESCRIPTION	MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
POST-REMEDIAL ACTION OPERATIONS (100 YEAR DURATION)										
Install Permanent Markers/Survey	12	EA	$ 5,000	NA				$ 60,000		$ 60,000
Replace Perimeter Security Fence	10,000	LF	$ 20	NA				$ 200,000		$ 200,000
Repair and Replace Perimeter Signs	1	LS	$ 10,000	NA				$ 10,000		$ 10,000
Subtotal										**$ 270,000**
COVER MAINTENANCE										
Cover Maintenance Cost - 100 Year Duration Annual Cap Maintenance Costs	100	YR	$ 22,500	NA				$ 2,250,000		$ 2,250,000
Subtotal										**$ 2,250,000**
SURVEILLANCE AND MONITORING										
Groundwater Monitoring: (16-wells)										
Groundwater Monitoring, Quarterly for 2 Years - (8-Sampling Events)	8	EVT	$ 1,000	8	EVT	$ 11,000	$ 88,000	$ 8,000	$ 854,936	$ 950,936
Groundwater Monitoring, Semi -Annually for 3 Years - (6-Sampling Events)	6	EVT	$ 1,000	6	EVT	$ 11,000	$ 66,000	$ 6,000	$ 641,202	$ 713,202
Groundwater Monitoring, Annually for 95 Years (95-Sampling Events)	95	EVT	$ 1,000	95	EVT	$ 11,000	$ 1,045,000	$ 95,000	$ 10,152,365	$ 11,292,365
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)	1	LS	1,295,650	NA				$ 1,295,650		$ 1,295,650
Vadose Zone Monitoring:										
Sample 37 Lysimeters 1 Time per Year in Late Spring	100	EVT	$ 1,000	100	EVT	$ 17,875	$ 1,787,500	$ 100,000	$ 2,671,700	$ 4,559,200
Sample & Analyze 20 Vapor Ports 4 Times per Year for 5 Years	20	EVT	$ 1,000	20	EVT	$ 27,500	$ 550,000	$ 20,000	$ 140,000	$ 710,000
Sample & Analyze 20 Vapor Ports 1 Time per Year thereafter	95	EVT	$ 1,000	95	EVT	$ 27,500	$ 2,612,500	$ 95,000	$ 665,000	$ 3,372,500
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)	1	LS	$ 864,170	NA				$ 864,170		$ 864,170
Surface Water Monitoring:										
Collect Sample from 2 Points 2 Times Every 5 Years (20 Sample Events)	20	EVT	$ 100	20	EVT	$ 1,375	$ 27,500	$ 2,000	$ 320,660	$ 350,160
Air Monitoring (Radiological/Organic):										
Monitor 4 Existing CAMs	100	EVT	$ 1,000	100	EVT	$ 2,200	$ 220,000	$ 100,000	$ 15,300	$ 335,300
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)	1	LS	$ 33,530	NA				$ 33,530		$ 33,530
Perimeter Radiological Monitoring GPS with NaI Detector										
2 People, 1-Time per Year, 2 Days in Summer with Hummer & GPS	100	YR	$ 500	100	YR	$ 2,200	$ 220,000	$ 50,000		$ 270,000
Data Interpretation/Plot Data	100	YR	$ 750	100	YR	$ 2,500	$ 250,000	$ 75,000		$ 325,000
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)	1	LS	59,500	NA				$ 59,500		$ 59,500
Biological Monitoring:										
2 People 2-Times per year, First 5-Years for Intrusion Monitoring	NA			2	EVT	$ 1,100	$ 2,200			$ 2,200
2 People 1-Time, Every 5th Year thereafter for 95 years	NA			19	EVT	$ 1,100	$ 20,900			$ 20,900
Subtotal										**$ 25,155,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
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(continued).

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CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/24/02

	DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP COST	OTHER COST	TOTAL COST
	Subtotal Surveillance and Monitoring (Sampling & Monitoring Activities)											**$ 27,675,000**
	WAG 7 MANAGEMENT											
	WAG 7 Management (@ 5% of other post-RA operations costs)	5%	NA			1	LS	$ 1,383,750	$ 1,383,750			$ 1,383,750
	Annual Data Summary Report (100 reports @ 200 hrs/report)					20,000	HR	75.00	$ 1,500,000			$ 1,500,000
	WAG-Wide RA 5 Year Reviews for 100 Years (20 5-year reviews @ 600 hrs/review)		NA			12,000	HR	$ 75	$ 900,000			$ 900,000
	Subtotal											**$ 3,783,750**
	TOTAL COST - Post-Remedial Action Operations (100 Year Duration)											**$ 31,458,750**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE LIMITED ACTION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

Attachment D-7

Operable Unit 7-13/14 Feasibility Study Cost Estimate for the Full Encapsulation Alternative

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost estimate are likely to occur as a result of new information and data collected during the engineering design, safety reviews, and remedial alternative. Major changes may be documented in the form of a memorandum in the administrative record file, an explanation of significant differences, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within –30 to +50 percent of the actual project cost.

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE FULL ENCAPSULATION ALTERNATIVE

Project Title:	WAG 7 OU 13/14 Feasibility Study
Estimator:	Brian K. Corb
Date:	December 2002
Estimate Type:	Planning
Reviewed/Appr.:	Lee Lindig/Bruce L. Stevens

I. SCOPE OF WORK:

A. Remedial Design and Remedial Action

Constructing the Full Encapsulation alternative will be implemented in two phases because a portion of the SDA is currently active and receiving waste material. Phase 1 will cover the inactive portion of the site (105 acres) and Phase 2 will cover the currently active portion of the site (5 acres) after disposal operations are completed in 2020. Constructing the Full Encapsulation alternative includes preconstruction activities, placing earth fill, horizontal barrier construction (grouting subsurface basalt), vertical barrier construction (slurry wall), ISG for waste treatment and stabilization, foundation stabilization grouting for waste stability, placing cover system layers, and placing erosion control materials. Preconstruction activities will include field testing horizontal barrier installation, investigating borrow sources, preparing final design, completing a readiness assessment, and mobilizing.

Initially, a minimum 5-ft-thick layer of earthen fill will be placed over the SDA to minimize contact with waste materials during subsequent construction activities. This will provide a contouring layering with an average thickness of 5 ft across the site. Concurrent the earthen fill operations, the Pad A waste will be excavated and placed without treatment beneath the grading fill to reduce the vertical profile of the waste pile. Before grouting activities, ISTD technology will be applied to the waste streams in pits containing high organic concentrations to remove VOCs (approximately 5 acres). Following completion of earthen fill placement and ISTD, grouting the subsurface basalt layer and slurry wall construction will begin for making horizontal and vertical barriers. As the horizontal barrier is completed, other activities will begin including jet grouting with specialized grout to treat waste in SVRs and other areas. Foundation grouting with cement-based grout will stabilize waste and reduce settlement in other areas of the SDA.

As grouting is completed, various cover system layers will be installed, including additional earthen fill, gas collection, infiltration barrier, biotic barrier, filter, and topsoil layers. Placing erosion control materials will include constructing a flood control berm around the perimeter of the cover system, placing armor (riprap and other materials) on cover system and berm side slopes, and establishing vegetation.

B. Long-Term Monitoring and Maintenance

After the remedial action has been completed, long-term monitoring and maintenance will continue for 100 years, with CERCLA reviews conducted every 5 years. The long-term environmental monitoring will be conducted for groundwater, vadose zone water, surface water, and air. In addition, the cover system itself will be monitored annually during the first 5 years following completion of construction (beginning after the vegetation establishment period). After that, monitoring frequency will be reduced to every 5 years concurrent with 5-year reviews required under CERCLA. The cover system will be monitored for vegetation density, erosion damage, and differential settlement. Areas of erosion damage will be repaired with additional topsoil or earthen fill and reseeded. Areas without established vegetation will be reseeded.

II. BASIS OF ESTIMATE:

The basis of the estimate was developed from the following sources to provide a defensible and comparative cost of the remedial alternatives. The applicable sources available for the Full Encapsulation alternative include:

A. EPA, "A Guide to Developing and Documenting Cost Estimates During Feasibility Study," July 2000.

B. INEEL, "Cost Estimating Guide," DOE/ID-10473, September 2000.

C. "Environmental Assessment and Plan for New Silt/Clay Source Development and Use at the Idaho National Engineering and Environmental Laboratory," DOE/EA-1083, May 1997.

D. *Caterpillar Equipment Performance Handbook*, 31st edition.

E. The INEEL Site Stabilization Agreement, Union Labor Agreement.

F. Facilities Unit Costs—Military Construction, PAX Newsletter No. 3.2.2—10, March 2000.

G. ICDF Construction Cost Estimate, Cap Construction Cost (CH2MHILL) December 2000.

H. Subject Matter Experts—M. Jackson, BBWI and T. Borschel, BBWI, "Availability of Borrow Source Material at the INEEL."

I. BBWI, "INEEL Site Craft and Professional Services Labor Rates," February 2002.

J. OMB, 2002, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs," Appendix C, "Discount Rates for Cost-Effectiveness, Lease Purchase, and Related Analyses," OMB Circular A-94, February 2002.

K. R. S. Means, 2002, *Heavy Construction and Industrial Building Unit Costs Data* 16th edition, Kingston, Massachusetts.

L. INEEL, "Analytical Laboratory Unit Costs."

III. ASSUMPTIONS:

The primary work associated with the Full Encapsulation alternative includes placing horizontal and vertical barriers, waste and foundation stabilization grouting, and placing a cover system over the SDA. Because some portions of the SDA will continue operating until 2020, construction is divided into two phases. Phase 1 includes placing the cover system over approximately 105 acres of inactive portions of the SDA. Phase 2 includes placing the cover system over an estimated 5 acres of the SDA that will remain active until 2020. Specific elements of the work and important assumptions are provided below:

A. Management and Oversight

A.1 Project Management for the BBWI oversight of this alternative has been estimated based on an average classification of job categories using the BBWI rates. The number of FTEs are based on 2,000 MH per person per year.

A.2 The RD/RA schedule assumes that the budgetary funding will not be constrained.

A.3 The RD/RA schedule assumes that no unexpected delays will result from changes to the USQ/SAR process.

A.4 The estimate assumes that INEEL site resources (i.e., CFA, medical facilities, geotechnical lab, fire department, security, utilities at the SDA) will be available for the duration.

B. Design and Preconstruction

B.1 Preconstruction activities—Borrow source investigations, field testing of horizontal barrier construction, cultural resource clearance, developing an onsite source of basalt rock, final design, readiness assessment completion, and mobilizing.

C. Site Preparation and Support Activities and Facilities

C.1 Placing initial earthen fill—Site clearing and grubbing and leveling (including regrading of Pad A) and placing minimum 5 ft of earthen fill over grouting areas.

C.2 In situ thermal desorption will be performed to remove VOCs from high-concentration waste streams in the pits before grouting operations. The ISTD technology will be applied over a surface area of 5 acres, 14 ft deep.

C.3 Modular containment buildings were evaluated including Butler and Sprung structures. The cost provided for the ISG considers a Sprung-type containment structure for the grouting operation. No containment structure is required for the horizontal barrier or foundation stabilization grouting operations. Costs for these facilities include fire protection, HVAC, lighting, communication lines, and power distribution.

D. Horizontal and Vertical Barrier Construction

D.1 Horizontal barrier construction—A horizontal barrier will be constructed by pressure grouting the basalt layer beneath the SDA. This would be achieved by pushing casing through the waste, drilling through the casing into the subsurface basalt layer, and pressure grouting the basalt.

D.2 For horizontal barrier construction, casing can be pushed through waste materials to the subsurface basalt layer, a 5-ft depth of the basalt layer will be drilled and grouted, 1 ft^3 of cuttings will be generated per drill hole and will be disposed of onsite or at another approved INEEL facility, average grout uptake will be 20%, and average grout hole spacing will be on 10-ft centers. Developing capital and operational costs for installing the subsurface horizontal barrier is presented in Table 1.

D.3 Vertical barrier construction—A vertical barrier will be installed by constructing a slurry wall around the SDA. A trench to the horizontal barrier (grouted basalt) at the perimeter of the SDA will be excavated and backfilled with a soil bentonite mixture.

D.4 For vertical barrier construction, a slurry wall will be constructed around the entire perimeter of the SDA (10,000 linear ft) with an average depth of 20 ft and an average width of 3 ft.

E. Organic Area Treatment with In Situ Thermal Desorbtion

E.1 In situ thermal desorption will be used to treat the high organic waste streams before placing the surface barrier. ISTD will employ an array of heated stainless steel pipe assemblies inserted into the ground on an 8 × 8-ft spacing to a depth of approximately 3 ft below the buried waste.

E.2 Each pipe assembly will include a sealed pipe that contains an electrical-resistance-heating element, a vented pipe to extract gases, and thermocouples. Extraction pipes will be connected to a pipe manifold that conveys gases to an off-gas treatment system. The average pipe assembly will be inserted to a depth of 24 ft. Pipe assemblies will be inserted into the ground using either nonstandard vibratory or hydraulic techniques.

E.3 Heat can be transferred from the heating elements to the pipes and then to the waste at a nominal rate of 350 W per lineal ft of heated pipe.

E.4 Six ISTD systems will be used. With the 8 × 8-ft spacing of the pipe assemblies, heating will occur over about a 90-day period. The six systems are projected to treat approximately 0.5 acres per year, requiring 2.5 years to complete the projected five acres.

E.5 The ISTD systems will require about 330 kW.

E.6 When a subsystem reaches its heating objectives, the pipe manifold that collects off-gases will be isolated from the rest of the off-gas manifold by closing valves. The 12 or 20 extraction pipes in the subsystem will be crimped closed, the manifold section will be disconnected and transported to the front of the advancing ISTD system, and reconnected after purging at that location.

F. Pad A waste retrieval and management.

F.1 It is assumed that 20 drums of TRU waste will be generated during the retrieval actions, which will require off-Site disposal at WIPP.

F.2 The Pad A retrieval operations will require a primary and secondary containment structure, approximately 230 x 410 ft in plan dimensions and designed in accordance with the IBC. Frost depth for building foundations is 5 ft (DOE-ID 2001). The ground snow load of at least 35 lb/ft^2 shall be used in ASCE 7 calculations and a minimum roof snow load of 30 lb/ft^2 shall be used for all buildings (DOE-ID 2001). Retrieval buildings and other structures shall not be designed for tornado loads (DOE-ID 2001). All structures shall be designed for PC 2 standards for wind, seismic, and flood design requirements. The PC 2 seismic return period is 1,000 years (STD-1020). The fastest wind speed for INEEL structures is 70 mph, and the 3-second gust wind speed is 90 mph (DOE-ID 2001). The design mean hazard annual probability for floods is 5E-04, or a 2,000-year return period (STD-1020). Fire protection systems shall meet or exceed the minimum requirements established by the NFPA and DOE O 420.1.

F.3 The primary and secondary containment structure is a double-walled structure equipped with radiation alarm systems such as constant air monitors that would alarm when airborne contamination reached unacceptable levels. Criticality alarms would be installed in the primary containment structure. These alarm systems would require periodic testing and calibration.

F.4 The containment building will be dismantled, collapsed, and buried beneath the surface barrier. A cost allowance of 25% of the capital expenditures of the building costs is assumed representative of the estimated level of effort to dispose of the buildings and equipment.

F.5 The structure would include a gantry crane that would be used to apply water, foams, and foggers to keep dust and contamination at a minimum within the retrieval operation. The crane would provide support for lifters, detectors, and other equipment.

F.6 Negative pressure would be applied to the digface at all times and directed to HEPA filters to control the contamination and keep it from entering the secondary containment structure. Air exhausted from the retrieval zone would be fully saturated with water vapor because of misting to control airborne contamination. Some water vapor would condense in the ductwork leading to the air treatment system. This condensate would be recycled through the retrieval-face misting system, as would other condensates. The air treatment system consists of chillers, demisters, heaters, and banks of HEPA filters in two parallel systems to provide redundancy if one system failed. The chillers would cool the air, which would decrease the dew point and cause mists to form. The air would then pass through a demister to remove moisture. The air would then pass through heating elements to raise the temperature to about 10°C above dew point. The air then would pass through the HEPA filters.

G. ISG and Foundation Grouting Assumptions

G.1 The ISG equipment and enclosures will be dismantled and disposed of under the surface barrier. Twenty-five percent of the capital equipment expenditure is assumed and included in the estimate for D&D&D of equipment.

G.2 The TRU pits and other trenches will be only low-pressure grouted for foundation stabilization.

G.3 The grouting operations can be performed without any surface radiological contamination from the grout returns observed at the ground surface.

G.4 The grout production rate of one hole every 4 minutes can be maintained and no subsurface anomalies would further reduce the assumed efficiency of 70%. ISG will begin after placing initial earthen fill over a significant portion of grouting areas. ISG for waste treatment will be performed using the same grouting technique and grout types described for the ISG alternative, however ISG will be limited to the SVRs and portions of the waste trenches where activation and fission product waste are located. Specific assumptions related to ISG are provided in the ISG alternative cost estimate.

G.5 The SVRs and trench areas containing activation and fission products will be treated using the ISG technology and based on a 2-ft center-to-center spacing. One hole will be grouted every 4 minutes.

G.6 Foundation stabilization grouting will be applied using low-pressure jet grouting technology and based on a 4-ft center-to-center spacing. One hole will be grouted every 4 minutes.

G.7 Grouting for foundation stabilization will be performed using a modified drill rig to inject grout under high pressure into the waste stream. The grout will fill readily accessible void space and cure into a solid monolith. This technique allows using a relatively low-cost cement-based grout instead of specialized grout types for waste treatment. Unlike the ISG portion of the alternative, the foundation stabilization operation would not be required to completely mix the grout with the waste or soil. Voids that could threaten integrity of the surface barrier are large and would be intersected if the spacing between grout holes were larger than the spacing for ISG. In addition, it is assumed that substantially less grout would be needed for foundation stabilization because the grout would be injected on a less dense spacing, and waste was compacted when initially placed in the SDA. Assumptions for foundation stabilization grouting for the Surface Barrier are addressed in the ISG alternative cost estimate.

G.8 The equipment and crew size needed for ISG and foundation stabilization grouting is similar to the crew size and equipment needed for the ISG alternative.

G.9 Remaining earthen fill and the gravel gas collection layer of the surface barrier will be placed during grouting activities.

H. Borrow Areas

H.1 This PERA assumes that touse Spreading Area B as a borrow source, the area will need to be drilled and tested for material quality and quantity; an Environmental Assessment Plan will need to be revised; an Army Corps of Engineers Section 404 permit must be obtained, and a National Pollutant Discharge Elimination System

H.2 permit must be completed and approved. It is assumed that the permitting process for Spreading Area B will be completed concurrent with other preconstruction activities to avoid extending the construction schedule.

H.3 Spreading Area B will be available and will not be flooded. No additional costs have been provided to dewater Spreading Area B.

H.4 Adequate quantity and quality of borrow source material has been identified from Spreading Area B, the Borax Pit, and the Basalt Source (for riprap and coarse fractured material). Furthermore, no royalty fee or earthen material costs are provided for in the estimate.

H.5 An adequate water source will be available to support the earthmoving and soil moisture conditioning for placement and compaction based on equipment productivities assumed for this estimate.

H.6 The source of low-permeability soil will meet the hydraulic conductivity requirements of 10^{-7} cm/s and the soil will not require amendment with bentonite.

I. Cover System Construction

I.1 Placing earthen fill and gravel gas collection layers—Additional earthen fill (approximately 5 ft thick) will be placed to make an average 10-ft thick earthen fill covering the SDA, to grade the site for cover system construction. Six inches of gravel will be placed to collect gas that may be generated beneath the cover system.

I.2 Placing clay, geomembrane, and filter layers—A 2-ft-thick compacted clay layer and 60-mil HDPE geomembrane layer will be placed as infiltration barriers. A 1-ft-thick filter section consisting of sand and gravel will be placed over the geomembrane.

I.3 Placing remaining cover system layers—Remaining cover system layers will consist of a 2.5-ft-thick layer of coarse fractured basalt (biotic barrier layer), a 1-ft-thick filter layer consisting of sand and gravel, an 8-ft-thick layer of engineered earthen fill, and a 1-ft-thick layer of topsoil.

I.4 Placing perimeter berm and erosion controls—A 6-ft-high berm will be constructed around the perimeter of the cover system to control flooding; filter layers, coarse fractured basalt, and riprap will be placed on the side slopes to minimize erosion.

I.5 Establishing vegetation—The topsoil layer will be seeded with a specialized seed mix to provide a vegetative cover. The cover will be monitored and reseeded as necessary to maintain the vegetative layer.

J. Capital Costs, Unit Rates, and Other Pricing Assumptions

J.1 The unit prices have been developed from a crew build-up to process, load, haul, place, and compact. The volume of material represented in the cost tables identifies CCY. The appropriate factors convert the estimated unit material weights (bank, loose, and fill) and are factored into the equipment productivity.

J.2 Crew labor rates were based on hourly rates stipulated in the INEEL Site Stabilization Agreement. Labor and equipment spreads were based on assumed achievable daily productivity. Other factors that influenced the selection of labor and equipment quantities include safety, level of PPE of the work to be performed, haul routes, and availability of resources on the INEEL. Each daily crew cost also includes field oversight personnel such as the HSO, superintendents, foremen, CIHs, maintenance personnel, and allocation of supplies (e.g., fuel, oil, grease, and spare parts).

J.3 Primarily all capital equipment and pricing were selected from commercially available sources or similar projects allowing a scale factor to be applied to yield an estimated cost of conceptual equipment and operational requirements. Equipment installation cost is considered a significant variable in estimating individual components of a given system. The installation cost of the capital equipment was based on a percentage of capital costs ranging from 110 to 160% of the estimated capital expenditure based on the unknowns and level of complexity.

J.4 Subcontractors' bond and insurance rate of 2% of the total subcontractor dollars includes overhead and profit based on each alternative.

J.5 The estimate includes an allocation for the INEEL specific work order PRD requirements and safety meetings. Because this estimate includes primarily unit prices, the labor cost is estimated to be 40% of the unit prices and, based on historical data, cost of the INEEL-specific process is approximately 6% of total labor dollars.

K. Schedule

K.1 The estimate assumes that earthwork operations can be performed for 10 months per year without weather impacts. The work will be performed working two 10-hour shifts, with a back shift working 5 days per week performing maintenance.

K.2 The estimate assumes that field crews will demobilize the equipment during the 2-month winter shutdown to refurbish and replace the equipment. The estimate includes an allocation to cover these costs in addition to the 2% estimated.

L. Health and Safety

L.1 After the initial site grading material is placed over the SDA, all earthmoving operations can be performed in Level D.

L.2 The Pad A waste will be excavated and tightly placed in a single layer and buried beneath the cap grade fill. The estimate assumes that this waste will not be treated and the work will be performed in Level B.

M. Long-term Operating and Maintenance and Monitoring

M.1 The capital cost for the project includes the replacement and reinstallation of 37 existing lysimeters. The estimate assumes that lysimeters will be installed at varying depths of 20, 90, 200, and 600 ft along the interbed surfaces.

M.2 The lysimeter analytical cost assumes that liquid samples will be recovered in 10% of the wells. Therefore, analytical costs are included only for the assumed number of recoverable samples.

M.3 After topsoil has been placed as the final layer on the cover system, it will be seeded with native grasses to provide vegetative cover to reduce erosion. However, because of the arid climate, an extended period will be required to establish a permanent vegetative cover. Erosion of the uppermost layers of the cover system during snowmelt will occur during the years immediately following construction and repairs and reseeding will be required.

M.4 Ongoing maintenance of the cover system will be required in perpetuity after construction is completed. Frequent maintenance will be required during the years immediately following construction to repair damage from erosion and establish a permanent vegetative cover. In addition, the added weight of the cover system is expected to result in increased settlement during the initial years following construction. Some areas of the cover system will require ongoing maintenance to repair damage resulting from settlement. It is expected that annual maintenance and repairs will be required during the first 5 years following construction. Ongoing maintenance and repairs will continue every 5 years concurrent with the 5-year review process.

N. Design Costs

The following discussion provides the basis for the assumed percentage for design, construction, and contingency. EPA provides guidance for estimating remedial design costs in the EPA Guidance. Exhibit 5-8 of the EPA Guidance provides examples of remedial design costs as a percentage of total capital costs. The percentages range from 20% for projects with capital costs less than $100,000 to 6% for projects with capital costs greater than $10 million. The EPA Guidance does not provide an example of design costs that vary according to the complexity of technologies.

The alternatives include technologies that have been demonstrated on other sites and have well developed engineering design criteria (such as capping) and technologies that have not been demonstrated on a large scale and require development of engineering design criteria (such as ISV). Remedial design costs are expected to vary significantly according to the degree of complexity and the estimated costs for remedial design need to reflect that. Based on the complexity of the technology application, a percentage of the capital and operating cost specific to the technology was assumed.

The Surface Barrier system has been demonstrated on other sites and design standards have been developed for the various types of materials and construction methods. Some borrow source investigations will be needed to verify material properties and quantities, but methods for conducting these investigations are not expected to require specialized equipment or personnel. Because capping is a demonstrated technology with established design standards, the cost for remedial design is assumed to be 6% of capital costs.

ISG includes subsurface jet injection of specialized types of grout into waste disposal areas of the SDA to stabilize and treat waste materials. ISG will be carried out inside a modular building to contain possible releases of contaminants. Considerable effort will be needed to design appropriate grout types for the waste disposal areas, design the modular building and grouting equipment, and field test various design elements. Because of the additional design effort required for ISG, the cost for remedial design is assumed to be 8% of capital costs.

Foundation stabilization grouting using modified grouting equipment to jet grout areas of the SDA to fill voids within the waste and provide a stable foundation for placing and maintaining cover systems. Foundation stabilization grouting is similar to ISG except specialized grout and grouting equipment (including a modular building) will not be needed and grout holes will be spaced farther apart than for ISG. Cement-based grout and modified grouting equipment will be used for this technology. Field demonstrations will be conducted to verify the ability of the grouting equipment to penetrate waste disposal areas and to estimate how much grout will be needed. Because the design effort will be considerably less for foundation stabilization grouting than for ISG, the cost for remedial design is assumed to be 7% of capital costs.

The vertical barrier includes placing a slurry wall around the perimeter of the SDA. The wall will be constructed by excavating a trench to the basalt layer, placing slurry within the trench for stability during construction, and replacing the slurry with soil bentonite to create an impervious vertical barrier. Slurry wall technology has been demonstrated successfully at numerous sites and engineering design standards have been developed for this technology. Field testing would be needed to estimate the average depth of the slurry wall and the soil to bentonite ratio needed for the impervious barrier. Because the vertical barrier is a demonstrated technology with established engineering design standards, the cost for remedial design is assumed to be 6% of capital costs.

The horizontal barrier includes advancing a casing through soil and waste materials within the SDA to the top of the basalt layer beneath the site, drilling through the casing approximately 5 ft into the basalt layer, and pressure grouting the basalt layer with cement-based grout. The grouted basalt would create an impervious horizontal barrier. A modified ODEX drill rig will be used to advance the casing and drill into the basalt. Specialized equipment will need to be designed for the rig to contain cuttings and particulates generated during drilling into the basalt layer. Field testing will be needed to verify that casing can be advanced through the waste materials to the basalt layer and to estimate the variable hole spacing and grout quantities needed. Because of the additional design effort to contain cuttings and the field testing required, the cost for remedial design is assumed to be 8% of capital costs.

The various technologies and the percentages of capital costs estimated for remedial design are summarized in Table 1. These percentages are applied to individual technologies in the cost estimate to establish estimated design costs for the various alternatives.

O. Construction Management Costs

Cost considerations for BBWI oversight, regulatory agency interaction, and project management were estimated on a representative basis of an assumed level of effort required to implement the selected alternative. Additionally, costs for the remedial design, safety equipment and PPE, construction management, general conditions, and insurance and bonds were included to capture a relative basis for cost comparison and to identify other costs associated with implementing a given remedial alternative.

The percentage is based on total capital construction cost to implement the alternative. The percentage basis assumed for each category was selected considering the complexity of the alternative and risk and uncertainty of the approach. The cost identified under the category general conditions includes administration buildings, parking area, utilities, and support infrastructure to facilitate the remedial alternative.

P. Contingency Costs

EPA provides guidance for estimating contingency costs in the EPA Guidance (EPA 2000). EPA Guidance distinguishes between scope contingency and bid contingency costs. Scope contingency costs represent risks associated with incomplete design and include factors such as limited experience with technologies, additional requirements because of regulatory or policy changes, and inaccuracies in defining quantities or characteristics. Exhibit 5-6 of the EPA Guidance provides examples of scope contingencies. Bid contingency costs are ones unknown at the time of estimate preparation that become known as remedial action construction or O&M proceeds. Bid contingencies represent reserves for quantity overruns, modifications, change orders, or claims during construction. The EPA Guidance states that bid contingencies may be added to construction and O&M costs and typically range from 10 to 20%.

Because EPA Guidance suggests that contingency costs will vary according to the alternative technologies, varying contingency costs must be estimated for the PERA alternatives. Technologies have been evaluated separately to determine appropriate contingency costs. Scope and bid contingencies for each technology are discussed below.

Capping technology includes the using several types of materials in addition to those planned for biotic barrier technology, constructing infiltration barriers, and using synthetic materials. One significant assumption for this technology is that native materials will be available that meet infiltration barrier layer permeability requirements without using additives such as bentonite. Capping technology is assumed to require a scope contingency within the range of 10 to 20% as shown in Table 2. Because of the risk associated with the need for additional borrow sources for materials, using synthetic materials, and the possible need to use additives for infiltration barrier layer construction, the cost for scope contingency is assumed to be 15%. Most risks associated with capping technology will be significantly reduced during remedial design, therefore, the cost for the bid contingency is assumed to be 10%. The total contingency for capping technology is assumed to be 25% of capital costs.

ISG includes jet injection of various types of grout into waste materials in the SDA to stabilize and treat waste materials. ISG technology will require considering grout design, design of specialized grouting equipment and a modular containment building, and field demonstrations. ISG technology is assumed to require a scope contingency within the range of 15 to 35%. Because of the specialized design efforts required for this technology, the cost for the scope contingency is assumed to be 20%. Some significant construction risks will be associated with this technology because of unanticipated subsurface conditions, therefore, cost for the bid contingency is assumed to be 15%. The total contingency for ISG technology is assumed to be 35% of capital costs.

Foundation stabilization grouting includes jet-grouting areas of the SDA with cement-based grout to fill voids within the waste and provide a stable foundation for placing and maintaining cover systems. While foundation stabilization grouting is similar to ISG, design of specialized types of grout and a modular containment building will not be required. Scope and bid contingencies for foundation stabilization grouting are the same as for ISG (20 and 15%, respectively) with a total contingency for foundation stabilization grouting assumed to be 35% of capital costs.

Vertical barrier technology involves placing of a slurry wall around the perimeter of the SDA. Well-established engineering design standards have been developed for slurry wall technology so the risk for scope changes is low. Vertical barrier technology is assumed to require a scope contingency within the range of the scope contingency for vertical barriers in Table 2 (10 to 35%). A scope contingency of 15% is assumed for this technology because it has been demonstrated successfully at numerous sites and has well-established engineering design standards. The only construction risk for this technology will be the length and depth of the slurry wall and the percentage of bentonite to be added to the soil mix. These construction risks will be minimized by subsurface investigations and soil testing completed during design. Because of the low construction risks, a bid contingency of 10% is assumed for this technology. The total contingency for vertical barrier technology is assumed to be 25% of capital costs.

Horizontal barrier technology involves advancing a casing through soil and waste materials to the top of a subsurface basalt layer, drilling through the casing into the basalt layer, and pressure grouting the basalt layer with cement-based grout. Engineering design techniques for grouting fractured basalt have been developed for dam construction projects, and similar techniques will be used for this work. Field demonstrations will be necessary to verify that casing can be advanced through soil and waste material and to estimate grout hole spacing and grout quantities. Horizontal barrier technology is assumed to require a scope contingency within a range of 15 to 35%. Because grouting technology has been developed for fractured basalt, a scope contingency of 15% is assumed for this technology.

The construction risk for with this technology is very high. The degree of fracturing in the basalt is expected to vary significantly and this will impact the final spacing of grout holes and grout quantity. Because of the high construction risk, a bid contingency of 25% is assumed for this technology. The total contingency for horizontal barrier technology is assumed to be 40% of capital costs.

The scope and bid contingency percentages associated with this alternative are identified in Table 3. These percentages are applied to individual technologies in the cost estimate to establish a representative aggregate cost contingency.

Based on the scope contingency guidance provided in Table 2 for each of the technologies, a representative contingency was selected within the range provided, given the complexity and size of the project, and inherent uncertainties related to the remedial technology. However, the guidance document does not address all of the remedial technologies identified in this alternative. Specifically, the horizontal barrier, foundation stabilization grouting, and ISG technologieswould be within a scope contingency range of 15 to 35%, which is considered representative for this work and project scope.

IV. SCHEDULE:

The following activities comprise the RD/RA portion of the Full Encapsulation alternative. Table 4 and 5 show the corresponding durations, based on the estimated crew productivity, regulatory reviews and approvals, and weather constraints inherent to the INEEL site.

V. PRESENT WORTH ANALYSIS:

Guidance for present value analysis is provided in Chapter 4 of "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA 2000). EPA Guidance states that the present value analysis of a remedial alternative involves four basic steps:

1. Define the period of analysis
2. Calculate the cash outflows (payments) for each project year
3. Select a discount rate to use in the present value calculation
4. Calculate the present value.

Periods of analysis for the Full Encapsulation alternative include Phase 1 design and construction, Phase 2 design and construction, and O&M. The Phase 1 design and construction period is estimated to last 14.5 years beginning shortly after issuance of a ROD for the site. Phase 2 design and construction is estimated to last 5.5 years beginning shortly after currently active areas of the site are closed in 2020. The O&M period will begin at the end of the vegetation establishment period for Phase 1 construction and will continue for 100 years.

Cash outflows for the Full Encapsulation alternative will include payments for design and construction, periodic payments for major repairs, and annual O&M costs. EPA Guidance suggests that most capital costs should occur in the first year of remedial action. While this suggestion might be realistic for short-duration remedial actions, it is not a realistic assumption for the Full Encapsulation alternative because of the time required for design and construction. Cash outflows for the Full Encapsulation alternativewould be paid on an annual basis beginning with the borrow source and horizontal barrier investigations and remedial design and ending with the end of the vegetation establishment periods for Phase 1 and Phase 2 construction.

Annual capital cost payments vary with the level of activity. Relatively low annual payments would be made during the borrow source investigation, horizontal barrier investigation, remedial design, readiness assessment, and vegetation establishment periods, and relatively high annual payments would be made during heavy construction periods (vertical and horizontal barrier construction, grouting, and material excavation, processing, stockpiling, and placement). Periodic costs for major repairswould occur every 5 years concurrent with the 5 year reviews that CERCLA requires. Periodic costswould begin 5 years after Phase 1 construction and continue through the O&M period. Annual O&M costs would begin the first year after completion of Phase 1 construction and continue for 100 years. In accordance with EPA Guidance requirements, 2002 constant dollars are used for all annual and periodic cash outflows.

EPA Guidance requires using a real discount rate that approximates the marginal pretax rate of return on an average investment and has been adjusted to eliminate the effect of expected inflation. The real discount rate must be used with constant or real dollars that have not been adjusted for inflation. EPA Guidance recommends using a 7% real discount rate for present value analysis in most remedial action cost estimates. However, for federal facility sites being cleaned up using Superfund authority, EPA Guidance states that it is generally appropriate to apply the real discount rates found in Appendix C of OMB Circular A-94. The suggested rates for federal facility sites are based on interest rates from Treasury notes and bonds and are appropriate because the federal government has a different cost of capital than the private sector. The most current version of Appendix C of OMB Circular A-94 (revised February 2002) proposes a real discount rate of 3.9% for programs longer than 30 years. The 3.9% discount rate and constant dollars are used for the present value analysis of the full encapsulation alternative. The present value of the Full Encapsulation alternative is calculated using equations provided in EPA Guidance.

VI. RISK AND UNCERTAINTY:

Because a primary construction activity associated with the Full Encapsulation alternative is excavating, hauling, and placing of very large quantities of borrow material for the cover system, the highest risk for this alternative is losing use of a primary borrow source located close to the site. The largest quantity of material needed for the cover system is silt loam. For this alternative, it is assumed that sufficient quantities of silt loam will be available from Spreading Areas A and B, located near the site. If these sources are lacking in capacity or not available, the nearest alternative sources are the Ryegrass Flats and WRRTF borrow areas. Ryegrass Flats is 12 mi from the site and the WRRTF borrow area is 34 mi. Haul distances to the site from the spreading areas are 1.5 mi from Spreading Area A and 1 mi from Spreading Area B. Increased haul distances could increase the cost of materials and cause delays in the schedule.

Grouting for the subsurface horizontal barrier also has a high risk because the spacing of grout holes and the estimated grout uptake are unknown. The spacing of grout holes will be a function of the porosity (or fracturing) and the permeability of the subsurface basalt layer. If the basalt is highly fractured and the fractures are interconnected, the spacing could increase from 10-ft to 40-ft centers. If the basalt is massive with few fractures, the spacing could decrease from 10-ft to 5-ft centers. The degree of fracturing also will vary the estimated grout uptake by the basalt. A high degree of fracturing could allow the basalt to flow vertically as well as horizontally. This could result in the grout flowing deeper than 5 ft into the basalt or flowing upward into voids within the waste. Because the degree of fracturing in the basalt may vary significantly beneath the SDA, it is not possible to accurately predict the actual grout hole spacing or grout uptake for the subsurface horizontal barrier.

Another significant risk is the various assumptions related to grouting for waste treatment and foundation stabilization. Several general assumptions have been made concerning areas of the site that will need to be grouted, estimated grout uptake by the waste, and grouting production rate. None of these assumptions have been verified by tests using proposed grouting equipment in onsite waste pits, trenches, or soil vaults. Quantities of materials and the schedule for grouting could deviate significantly from the quantities and production rates assumed for this PERA.

Assumptions regarding the quality of material available for the cover system may be found invalid during borrow source investigations. Compacted clay from Spreading Area B is assumed to be capable of meeting project specifications without the need for additives. If low-permeability requirements cannot be met by using the native material, bentonite will need to be added to reduce permeability. However, the quantity of bentonite needed would probably be low (around 5%) and adding it would reduce the compactive effort needed during placement to achieve the specified permeability. The additional time required for adding bentonite to the material could extend the project schedule.

VII. ESTIMATED MATERIAL VOLUME:

Tables 6 and 7 summarize required materials for the cover system of the Full Encapsulation alternative and related design layers, thickness, and volume.

VIII. TABLES:

Table 1. Summary of remedial design costs as percentages of capital and operating costs.

Technology	Percentage of Capital and Operating Costs
Capping (Cover System)	6
In situ thermal desorption	10
In situ grouting	8
Foundation stabilization grouting	7
Vertical barrier construction	6
Horizontal barrier construction	8

Table 2. Example feasibility study-level scope contingency percentages.

Remedial Technology	Scope Contingency (%)
Soil excavation	15 – 55
Vertical barriers	10 – 30
Synthetic cap	10 – 20
Clay cap	5 – 10
Surface grading and diking	5 – 10
revegetation	5 – 10

Table 3. Summary of contingency costs as percentages of capital costs.

	Percent of Capital Cost		
Remedial Technology	Scope Contingency	Bid Contingency	Total Contingency
Capping	15	10	25
In situ thermal desorption	25	25	50
In situ grouting	20	15	35
Foundation stabilization grouting	20	15	35
Vertical barrier construction	15	10	25
Horizontal barrier construction	15	25	40

Table 4. Phase 1—Design and Construction.

Activity Description	Estimated Duration
Borrow source investigation	1 year
Remedial design and procurement	1.5 years (overlaps borrow source inv. by 0.5 year)
Readiness assessment	1 year (no overlap with design)
Mobilization	0.5 year (no overlap with readiness assessment)
Pad A waste excavation and placement	2 years (no overlap with mobilization)
Initial earthen fill placement	1 year (overlaps Pad A exc. and placement by 1 year)
Horizontal barrier construction	6 years (overlaps earthen fill placement by 1 year)
Vertical barrier construction	1 year (overlaps horizontal barrier const. by 1 year)
Foundation and soil vault grouting	6 years (overlaps horiz. barrier constr. by 5 years)
In situ thermal desorption	2.5 years (overlaps horiz. barrier constr)
Grading fill and gravel placement	1 year (overlaps grouting by 1.0 year)
Clay/Geomembrane/Filter Layers	1 year (overlaps grading fill placement by 0.5 year)
Placement of remaining layers	1 year (overlaps clay/geomembrane/filter by 0.5 year)
Vegetation establishment	2 years (no overlap with placement of rem. layers)

Table 5. Phase 2—Design and Construction.

Activity Description	Estimated Duration
Remedial design and procurement	1 year assumed
Readiness assessment	1 year (no overlap with design)
Mobilization	0.5 year (no overlap with readiness)
Grouting and cover system construction	1 year (no overlap with mobilization)
Vegetation establishment	2 years (no overlap w/grouting/cover system)

Table 6. Distances and sources of borrow materials for the modified Resource Conservation and Recovery Act Subtitle C cover system.

Material	Issue	One-way Haul Distance	Source
Topsoil	This material would consist of organic silt loam and would be used to construct a topsoil layer to support vegetation on top of the cover system.	1.5 mi	This material is assumed to be unprocessed organic silt loam derived from Spreading Area B.
Silt loam	This material would be used to construct a number of the layers within the cap including the general site grading fill, perimeter berm, and engineered earth fill.	1.5 mi	The majority of this material is expected to be unprocessed silt loam derived from Spreading Area B. Additional material is available from Ryegrass Flats (haul distance = 12 mi) and the WRRTF borrow area (haul distance = 34 mi).
Silt loam	This material would be used to construct the compacted clay layer within the cover system.	1 mi	If permits and approvals can be obtained, the majority of this material is expected to be unprocessed silt loam derived from Spreading Area B. Similar material might be available from Spreading Area A (haul distance = 1.5 mi), Ryegrass Flats (haul distance = 12 mi), and the WRRTF borrow area (haul distance = 34 mi).
Gravel	This material would be used for the coarse filter layers within the cap. Sufficient quantities of good structural gravel and fines materials are available.	2.5 mi	This material is assumed to be processed gravel derived from the Borax Gravel Pit.
Sand	This material would be used for the fine filter layers within the cover system. No identified bank run borrow areas are available within the INEEL boundary.	45 mi	This material is assumed to be imported from off-Site.

Table 6. (continued).

Material	Issue	One-way Haul Distance	Source
Riprap	Riprap would be used for erosion control. The majority of the mined riprap material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.
Coarse fractured basalt	This material would be used as bio-barrier material within the cover system. The majority of the mined coarse fractured basalt material at the INEEL has been used for other remedial actions at the INEEL.	5 mi	This material is assumed to be processed material mined from a basalt outcropping identified 5 mi from the site, directly west of the RWMC and just outside the Big Lost River System.
Cobbles	This material would be used as bio-barrier material if coarse fractured basalt is not available or is not allowed for such use. No identified borrow areas are within the INEEL boundary.	45 mi	This material is assumed to be processed material transported to the INEEL from Idaho Falls.

INEEL = Idaho National Engineering and Environmental Laboratory
RWMC = Radioactive Waste Management Complex
WRRTF = Water Reactor Research Test Facility

Table 7. Full encapsulation alternative cover system design layers, thickness, and volume.

Layer	Thickness	Approximate Volume[a]	Material Description
Phase 1 Construction (105 acres with initial grading fill for grouting plus perimeter berm and side slope. protection)			
Topsoil	12 in.	169,400 CCY	Unprocessed organic silt loam from Spreading Area B.
Engineered earth fill	96 in.	1,355,200 CCY	Unprocessed silt loam from Spreading Area B.
Fine filter	12 in.	169,400 CCY	Processed sand from an off-Site borrow source.
Coarse filter	12 in.	169,400 CCY	Processed gravel from the Borax Gravel Pit.
Coarse fractured basalt (biotic barrier)	30 in.	423,500 CCY	Processed basalt mined from an INEEL site.
Coarse filter	12 in.	169,400 CCY	Processed gravel from the Borax Gravel Pit.
Fine filter	12 in.	169,400 CCY	Processed sand from an off-Site borrow source.
Geomembrane	60 mil	508,200 SY^2	HDPE from off-Site sources.
Compacted clay	24 in.	338,800 CCY	Unprocessed silt loam from Spreading Area B.
Gravel gas collection layer	6 in.	84,700 CCY	Processed gravel from the Borax Gravel Pit.
Final grading fill	60 in.	847,000 CCY	Unprocessed silt loam from Spreading Area B.

Table 7. (continued).

Layer	Thickness	Approximate Volume[a]	Material Description
Initial grading fill	60 in.	847,000 CCY	Unprocessed silt loam from Spreading Area B for initial 5-ft layer before grouting.
Fine filter	12 in.	15,200 CCY	Processed sand from off-Site borrow source for cover system side slope protection; 41-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V side slopes.
Coarse filter	12 in.	15,200 CCY	Processed gravel from the Borax Gravel Pit for cover system side slope protection; 41-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V side slopes.
Coarse fractured Basalt	12 in.	15,200 CCY	Processed basalt mined from an INEEL site for cover system side slope protection; 41-ft long; 1-ft thick; 10,000-ft perimeter; 2.5H:1V side slopes.
Riprap	36 in.	45,600 CCY	Processed basalt mined from an INEEL site for cover system side slope protection; 41-ft long; 3-ft thick; 10,000-ft perimeter; 2.5H:1V side slopes.
Riprap	36 in.	15,600 CCY	Processed basalt mined from an INEEL site for berm side slope protection; 14-ft long; 3-ft thick; 10,000-ft perimeter; 2H:1V side slopes.
Perimeter berm	NA	244,200 CCY	Unprocessed silt loam from Spreading Area B; berm average 6- ft high; 100-ft wide; 10,000-ft perimeter; 2H:1V side slopes.
Phase 2 Construction (5 acres with no grouting, berm construction, or side slope protection)			
Topsoil	12 in.	8,100 CCY	Unprocessed organic silt loam from Spreading Area B.
Engineered earthen fill	96 in.	64,500 CCY	Unprocessed silt loam from Spreading Area B.
Fine filter	12 in.	8,100 CCY	Processed sand from an off-Site borrow source.
Coarse filter	12 in.	8,100 CCY	Processed gravel from the Borax Gravel Pit.
Coarse fractured basalt (biotic barrier)	30 in.	20,200 CCY	Processed basalt mined from an INEEL site.
Coarse filter	12 in.	8,100 CCY	Processed gravel from the Borax Gravel Pit.
Fine filter	12 in.	8,100 CCY	Processed sand from an off-Site borrow source.
Geomembrane	60 mil	24,200 SY	HDPE from off-Site sources.
Compacted clay	24 in.	16,100 CCY	Unprocessed silt loam from Spreading Area B.
Gravel gas collection layer	6 in.	4,000 CCY	Processed gravel from the Borax Gravel Pit.
Grading fill	120 in.	80,700 CCY	Unprocessed silt loam from Spreading Area B

a. This table provides estimated in-place volumes rounded to the nearest 100 CCY.
CCY = compacted cubic yard
HDPE = high density polyethylene
INEEL = Idaho National Engineering and Environmental Laboratory
SY = surface yard

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE FULL ENCAPSULATION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
FFA/CO MANAGEMENT AND OVERSIGHT											
WAG 7 Management (16-Years)											
Coordination/Oversight Tech Support (E28) - 1.0 FTE/YR		NA			32,000	HR	$ 93	$ 2,967,040			$ 2,967,040
Coordination with Agency Participants (E28) - 0.5 FTE/YR		NA			16,000	HR	$ 93	$ 1,483,520			$ 1,483,520
Environmental Engineering (E08) - 1.0 FTE/YR		NA			32,000	HR	$ 76	$ 2,421,440			$ 2,421,440
Cost and Schedule Control (F10) - 2.0 FTE/YR		NA			64,000	HR	$ 59	$ 3,768,960			$ 3,768,960
Regulatory Compliance (S11) - 1.0 FTE/YR		NA			32,000	HR	$ 79	$ 2,528,320			$ 2,528,320
Quarterly and Annual Reviews (S21) - 1.0 FTE/YR		NA			32,000	HR	$ 73	$ 2,325,760			$ 2,325,760
Audit Preparation and Coordination (S11) - 0.5 FTE/YR		NA			16,000	HR	$ 79	$ 1,264,160			$ 1,264,160
Health and Safety Coordination/Training (S08) - 2.0 FTE/YR		NA			64,000	HR	$ 62	$ 3,988,480			$ 3,988,480
Annual O&M Reports (S15) - 0.5 FTE/YR		NA			16,000	HR	$ 79	$ 1,256,640			$ 1,256,640
Attorney/Legal Fees, 0.3 FTE/YR		NA			9,600	HR	$ 150	$ 1,440,000			$ 1,440,000
Allocation for Other Direct Costs (ODCs) - 10% of Total Labor		NA			1	LS	$ 2,200,432	$ 2,200,432			$ 2,200,432
TOTAL COST - FFA/CO Management and Oversight											$ 25,645,000
Construction Management											
Construction Management (@ 6% of Phase 1 & 2 RA Costs)	6%	NA			1	LS	$ 42,482,040	$ 42,482,040			$ 42,482,040
General Conditions (@ 1.25% of Phase 1 & 2 RA Costs)	1.25%	NA			1	LS	$ 8,850,425	$ 8,850,425			$ 8,850,425
Health and Safety Equipment Allocation (@ 0.25% of Phase 1 & 2 RA Costs)	0.25%	NA			1	LS	$ 1,770,085	$ 1,770,085			$ 1,770,085
Medical Monitoring/Surveillance/Air Monitoring (@ 0.10% of Phase 1 & 2 RA Costs)	0.10%	NA			1	LS	$ 708,034	$ 708,034			$ 708,034
TOTAL COST - Construction Management											$ 53,811,000
TREATABILITY STUDIES											
Treatment Treatability Studies, ISG/ISTD (@ 5% of Grouting, ISTD, Horizontal Barrier)	5%				1	LS	$ 14,710,350	$ 14,710,350			$ 14,710,350
TOTAL COST - Treatability Studies											$ 14,710,000
REMEDIAL DESIGN AND REMEDIAL ACTION PLANS/REPORTS											
Grouting RD/RA Workplan (@ 8% of Grouting Capital & Operations)	8%				1	LS	$ 11,545,920	$ 11,545,920			$ 11,545,920
ISTD RD/RA Workplan (@ 8% of ISTD/PAD A Capital/Operations Cost)	8%				1	LS	$ 4,396,240	$ 4,396,240			$ 4,396,240
PAD (A) Excavation RD/RA Workplan (@ 10% of PAD A Capital/Operations)	10%				1	LS	$ 8,884,400	$ 8,884,400			$ 8,884,400
Perimeter Slurry Wall RD/RA Workplan (@ 6% of Installation Costs)	6%				1	LS	$ 1,452,180	$ 1,452,180			$ 1,452,180
Horizontal Barrier RD/RA Workplan (@ 8% of Installation Costs)	8%				1	LS	$ 11,990,640	$ 11,990,640			$ 11,990,640
Surface Barrier RD/RA Workplan (@ 6% of Phase 1 & 2 Surface Barrier Operations)	6%				1	LS	$ 5,850,180	$ 5,850,180			$ 5,850,180
Readiness Assessment (@ 1.5% of RA)	1.5%				1	LS	$ 10,620,510	$ 10,620,510			$ 10,620,510
Remedial Action Report					7,500	HR	$ 76	$ 567,525			$ 567,525
TOTAL COST - Remedial Design											$ 55,308,000

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE FULL ENCAPSULATION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
ISTD APPLICATION FOR VOC REMOVAL (5 acres)											
Capital Equipment Costs											
ISTD Control Trailer		6	EA	$ 325,000	NA				$ 1,950,000		$ 1,950,000
ISTD Off-Gas Treatment		6	EA	$ 250,000	NA				$ 1,500,000		$ 1,500,000
ISTD Off-Gas Treatment Support (Chillers)		6	EA	$ 725,000	NA				$ 4,350,000		$ 4,350,000
ISTD Capital Costs (Assume 6-ISTD Systems Are Required)		1	LS	$ 5,256,620	NA				$ 5,256,620		$ 5,256,620
Electrical Power Supply/Overhead Powerline H-Frame		3	MI	$ 375,000	NA				$ 1,125,000		$ 1,125,000
Electrical Substation/Transformers for Site Distribution		2	EA	$ 125,000	NA				$ 250,000		$ 250,000
Operation											
ISTD Operational Costs (acreage)		5	AC	$ 153,103	5	AC	$ 4,030,658	$ 20,153,290	$ 765,515		$ 20,918,805
Power Consumption/Utilities		NA			NA					$ 2,285,000	$ 2,285,000
ISTD Secondary Waste Disposal		NA			NA					$ 5,000,000	$ 5,000,000
Installation/Pre-Operational Set-up/Testing (Percentage of Total Capital Costs)	10.0%				1	LS	$ 1,519,714	$ 1,519,714			$ 1,519,714
Back-up Generators (Diesel Powered)		2	EA	$ 137,500	NA				$ 275,000		$ 275,000
Repair/Maintenance/Spare Parts (Percentage of Operating/Treatment Costs)	25.0%				1	LS	$ 5,038,323	$ 5,038,323			$ 5,038,323
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 989,369	NA				$ 989,369		$ 989,369
D&D Cost for Equipment (Percentage of Capital Equipment)	10.0%	NA			NA					$ 1,443,162	$ 1,443,162
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	1,974,011	$ 1,974,011			$ 1,974,011
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,077,500	$ 1,077,500
Subtotal											**$ 54,953,000**
PAD A EXCAVATION											
Capital Equipment/Disposal Bins		1	LS	$ 7,620,000	NA				$ 7,620,000		$ 7,620,000
Building; RCS Materials and Erection		94,300	SF	$ 350	NA				$ 33,005,000		$ 33,005,000
Building; Radiological, Fire Protection, CCTV, HVAC		94,300	SF	$ 250	NA				$ 23,575,000		$ 23,575,000
Weather Enclosure (Assume 10% Larger Footprint)		103,730	SF	$ 65	NA				$ 6,742,450		$ 6,742,450
Over head Crane, Monitors, Misters		1	LS	$ 350,000	NA				$ 350,000		$ 350,000
Building Operations Costs		20	MO	$ 130,208	NA				$ 2,604,160		$ 2,604,160
Overburden Soil Removal/Stockpile		12,110	CY	$ 5	NA				$ 57,765		$ 57,765
PAD A Excavation and Waste Handling (2-years)		300	CD	$ 3,217	300	CD	$ 9,115	$ 2,734,500	$ 965,100		$ 3,699,600
Equipment Repair and Maintenance (10%)		1	LS	$ 96,510					$ 96,510		$ 96,510
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 227,547	NA				$ 227,547		$ 227,547
D&D Cost for Equipment	10.0%	NA			NA					$ 7,129,245	$ 7,129,245
Characterize TRU waste for WIPP disposal (per drum)		20	EA	$ 1,500	NA				$ 30,000		$ 30,000
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	$1,964,454	$ 1,964,454			$ 1,964,454
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,742,035	$ 1,742,035
Subtotal											**$ 88,844,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE FULL ENCAPSULATION ALTERNATIVE
(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
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DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
GROUTING											
EQUIPMENT											
Purchase & Modify Grout Batch Plant Capital Cost		1	LS	$ 8,326,000.0	NA				$ 8,326,000		$ 8,326,000
Mobilize/Erect Weather Structure Grouting Operations		2	EA	$ 750,198.0	NA				$ 1,500,396		$ 1,500,396
HEPA Filtration System/Lighting/Redundant Systems		2	EA	$ 2,147,448.0	NA				$ 4,294,896		$ 4,294,896
Back-up Generators (Diesel Powered)		2	EA	$ 375,000.0	NA				$ 750,000		$ 750,000
Building Foundation Construction		30,277	LF	$ 561.0	NA				$ 16,985,397		$ 16,985,397
Bridge Crane/Control System		3	EA	$ 670,000.0	NA				$ 2,010,000		$ 2,010,000
Bridge Crane/Control System/Modify and Install		NA			1	LS	$ 1,005,000	$ 1,005,000			$ 1,005,000
D&D Cost for Equipment/Enclosures	10.0%									$ 3,386,669	$ 3,386,669
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	873,100.54	$ 873,101			$ 873,101
Subcontractor Insurance/Bonds	2.0%				NA					$ 782,629	$ 782,629
Subtotal											**$ 39,914,000**
PRE-CONSTRUCTION ACTIVITIES											
Plug and Abandon (P&A) Existing GW Wells		NA			71	EA	$ 15,000	$ 1,065,000		$ 1,775,000	$ 2,840,000
Install New Nested GW Wells Outside Perimeter of Cap (Drilling Sub and Equipment)		NA			24	EA	$ 50,000	$ 1,200,000		$ 3,000,000	$ 4,200,000
Construct Rail Spur for Bulk Grout Delivery/Storage		1	LS	$ 1,200,000					$ 1,200,000		$ 1,200,000
INEEL Site-Specific Training/PRD/Work Order					1	LS	$ 164,700	$ 164,700			$ 164,700
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 168,094	$ 168,094
Subtotal											**$ 8,573,000**
OPERATIONS											
Fill Placment for Post ISG Decon (2-dt thick)		130,000	CCY	$ 10	NA				$ 1,300,000		$ 1,300,000
Grout Trench Areas (58-MD) Crew/Additives (Specialized)		79	CD	$ 181,314	79	CD	$ 40,902	$ 3,231,258	$ 14,323,806		$ 17,555,064
Grout SVRs (102-MD) Crew/Additives (Specialized)		34	CD	$ 181,314	34	CD	$ 40,902	$ 1,390,668	$ 6,164,676		$ 7,555,344
Repair/Maintenance/Spare Parts (Percentage of Operating/Treatment Costs)	10.0%				1	LS	$ 5,460,743	5,460,743			$ 5,460,743
Grout Rig Decontamination		3	EA	$ 2,125,800	NA				$ 6,377,400		$ 6,377,400
HEPA Filtration System Operation		2	YR	$ 2,000,000	NA				$ 4,000,000		$ 4,000,000
Verification Testing Geophysical Survey		4	MO	$ 40,000	2,500	HR	$ 76	$ 189,175	$ 160,000		$ 349,175
Foundation Stabilization Grouting (TRU Pits, Other Trenches, 739-MD)		342	CD	$ 99,763	286	CD	$ 40,902	$ 11,697,972	$ 34,118,946		$ 45,816,918
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 2,630,527	NA				$ 2,630,527		$ 2,630,527
INEEL Site-Specific Training/PRD/Work Order	6.0%	NA			1	LS	2,912,865	$ 2,912,865			$ 2,912,865
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,879,161	$ 1,879,161
Subtotal											**$ 95,837,000**
PERIMETER SLURRY WALL CONSTRUCTION (SDA)											
Installation/Construction of Slurry Wall (10,000 LF)		150	CD	$ 4,100	NA				$ 615,000		$ 615,000
Grout Plant Operation/Material Delivery		150	CD	$ 134,570	NA				$ 20,185,500		$ 20,185,500
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 2,428,591	NA				$ 2,428,591		$ 2,428,591
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	$ 499,212	$ 499,212			$ 499,212
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 474,566	$ 474,566
Subtotal											**$ 24,203,000**
HORIZONTAL BARRIER CONSTRUCTION											
Capital Cost		1	LS	$ 5,131,500	NA				$ 5,131,500		$ 5,131,500
Operation/Material Delivery (2-Shifts Per Day)		900	CD	$ 87,358	900	CD	$ 29,657	$ 26,691,300	$ 78,622,200		$ 105,313,500
Operation/Rig Maintenance Crew (Back-Shift)		900	CD	$ 6,829	900	CD	$ 5,054	$ 4,548,600	$ 6,146,100		$ 10,694,700
Equipment Decontamination		900	CD	$ 11,953	900	CD	$ 8,156	$ 7,340,400	$ 10,757,700		$ 18,098,100
Transportation/Disposal of Cuttings at ICDF		48,000	CF	$ 50	NA				$ 2,400,000		$ 2,400,000
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 2,832,756	NA				$ 2,832,756		$ 2,832,756
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	$ 2,473,380	$ 2,473,380			$ 2,473,380
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 2,938,879	$ 2,938,879
Subtotal											**$ 149,883,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE FULL ENCAPSULATION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
SURFACE BARRIER											
PRE-CONSTRUCTION ACTIVITIES											
Borrow Source Site Investigation		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
Spreading Area "B" 404 Permit Application (6-months)		1	LS	$ 200,000	NA				$ 200,000		$ 200,000
Surface Water Controls/Soil Erosion Sediment Control Features		1	LS	$ 250,000	NA				$ 250,000		$ 250,000
Site Preparation: Clear, Grub & Grade		125	AC	$ 3,800	NA				$ 475,000		$ 475,000
Construct 2-mile Haul Road from Borrow to Site (Stone Road)		2	MI	$ 500,000	NA				$ 1,000,000		$ 1,000,000
Install/Develop GW Wells for Compaction Water		3	EA	$ 250,000	NA				$ 750,000		$ 750,000
BUILDINGS AND EQUIPMENT											
Administrative Buildings (Lunch Room and Change Room)		10,000	SF	$ 95	NA				$ 950,000		$ 950,000
Equipment Maintenance/Storage Area		10,000	SF	$ 175	NA				$ 1,750,000		$ 1,750,000
Decontamintation Area		5,000	SF	$ 150	NA				$ 750,000		$ 750,000
Subtotal											**$ 6,375,000**
CONSTRUCTION											
Topsoil Layer - 1-ft Thick		169,400	CCY	$ 6	NA				$ 1,014,706.0		$ 1,014,706
Rip-Rap Layer - Perimeter Berm		15,600	CCY	$ 40	NA				$ 624,000.0		$ 624,000
Rip-Rap Layer - Sideslopes of Surface Barrier		45,600	CCY	$ 40	NA				$ 1,824,000.0		$ 1,824,000
Gravel Filter Layer, 1-ft Thick		169,400	CCY	$ 10	NA				$ 1,694,000.0		$ 1,694,000
Sand Filter Layer, 1-ft Thick		169,400	CCY	$ 25	NA				$ 4,235,000.0		$ 4,235,000
Gravel Filter Layer - Sideslopes of Surface Barrier, 1-ft Thick		15,200	CCY	$ 10	NA				$ 152,000.0		$ 152,000
Sand Filter Layer, - Sideslopes of Surface Barrier, 1-ft Thick		15,200	CCY	$ 25	NA				$ 380,000.0		$ 380,000
Gravel Gas Collection Layer - 0.5-ft Thick		84,700	CCY	$ 10	NA				$ 847,000.0		$ 847,000
Sand Filter Layer, 1-ft Thick		169,400	CCY	$ 25	NA				$ 4,235,000.0		$ 4,235,000
Gravel Filter Layer, 1-ft Thick		169,400	CCY	$ 10	NA				$ 1,694,000.0		$ 1,694,000
HDPE Geomembrane, 60-mil		508,200	SY	$ 6	NA				$ 2,795,100.0		$ 2,795,100
Compacted Clay Liner, 2-ft Thick		338,800	CCY	$ 12	NA				$ 4,068,988.0		$ 4,068,988
Biotic Barrier Layer - 2.5-ft		423,500	CCY	$ 50	NA				$ 21,175,000.0		$ 21,175,000
Coarse Fractured Basalt Layer - Sideslope of Surface Barrier, 1-ft		15,200	CCY	$ 50	NA				$ 760,000.0		$ 760,000
Engineered Earth Fill - 8-ft Thick		1,355,200	CCY	$ 5	NA				$ 6,464,304.0		$ 6,464,304
Grading Fill, 10-ft Thick Average (Less post ISG decon fill)		1,564,000	CCY	$ 5	NA				$ 7,460,280.0		$ 7,460,280
Perimeter Berm		244,200	CCY	$ 5	NA				$ 1,164,834.0		$ 1,164,834
Hydroseeding/Mulching (Re-seeding Included)		125	AC	$ 2,750	NA				$ 343,750.0		$ 343,750
Install (37) New Lysimeters and Cap Penetrations		37	EA	$ 131,756	NA				$ 4,874,972.0		$ 4,874,972
OCVZ Relocation/Well Extension		1	LS	$ 300,000	NA				$ 300,000.0		$ 300,000
Lab Geotechnical Testing (Gradation, hardness,density)		40	MO	$ 50,000	NA				$ 2,000,000.0		$ 2,000,000
Filed Geotechnical Testing (Density)		*40*	*MO*	*$ 90,000*	NA				*$ 3,600,000.0*		*$ 3,600,000*
Surveying/Grade Control		40	MO	$ 65,000	NA				$ 2,600,000.0		$ 2,600,000
Third-Party Independent CQA Testing/Certification		40	MO	$ 75,000	NA				$ 3,000,000.0		$ 3,000,000
Seasonal Shutdown/Re-Mobilization		3	EA	$ 500,000	NA				$ 1,500,000.0		$ 1,500,000
Mobilization and Demobilization (2% of Total Cost)	2.0%	1	LS	$ 1,673,639	NA				$ 1,673,638.7		$ 1,673,639
INEEL Site-Specific Training/PRD/Work Order		NA			1	LS	$ 2,084,534	$ 2,084,534			$ 2,084,534
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 1,778,802	$ 1,778,802
Pre-Final Inspection Report, Phase I		NA			1	LS	$ 250,000	$ 250,000			$ 250,000
Subtotal											**$ 84,594,000**
Subtotal Subcontractor Directs - Phase 1 Remedial Action											**$ 553,176,000**
Subcontractor Overhead	15.0%										$ 82,976,400
Subcontractor Profit	10.0%										$ 63,615,240
TOTAL REMEDIAL ACTION COST - Phase 1											**$ 699,768,000**

Prepared by CH2M HILL

3/21/2002

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE
FOR THE FULL ENCAPSULATION ALTERNATIVE
(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
SURFACE BARRIER - PHASE 2											
SITE PREPARATION											
Site Preparation: Clear, Grub & Grade		5	AC	$ 5,400	NA				$ 27,000		$ 27,000
Subtotal											**$ 27,000**
SURFACE BARRIER CONSTRUCTION											
Topsoil , 1-ft		8,100	CCY	$ 6	NA				$ 48,519		$ 48,519
Sand Filter Layer, 1-ft Thick		8,100	CCY	$ 25	NA				$ 202,500		$ 202,500
Gravel Filter Layer, 1-ft Thick		8,100	CCY	$ 10	NA				$ 81,000		$ 81,000
Biotic Barrier Layer - 2.5-ft Thick		20,200	CCY	$ 50	NA				$ 1,010,000		$ 1,010,000
Gravel Gas Collection, 0.5-ft Thick		4,000	CCY	$ 10	NA				$ 40,000		$ 40,000
Compacted Clay Liner		16,100	CCY	$ 12	NA				$ 193,361		$ 193,361
Gravel Filter Layer, 1-ft Thick		8,100	CCY	$ 10	NA				$ 81,000		$ 81,000
Sand Filter Layer, 1-ft Thick		8,100	CCY	$ 25	NA				$ 202,500		$ 202,500
HDPE Geomembrane		24,200	SY	$ 6	NA				$ 133,100		$ 133,100
Engineered Earth Fill, 8-ft Thick		64,500	CCY	$ 5	NA				$ 307,665		$ 307,665
Earth Grading Fill, 10-ft Thick		80,700	CCY	$ 5	NA				$ 384,939		$ 384,939
Hydroseeding/Mulching (Re-seeding Included)		5	AC	$ 2,750	NA				$ 13,750		$ 13,750
Lab Geotechnical Testing (Gradation, hardness, density)		10	MO	$ 50,000	NA				$ 500,000		$ 500,000
Filed Geotechnical Testing (Density)		10	MO	$ 90,000	NA				$ 900,000		$ 900,000
Surveying/Grade Control		10	MO	$ 65,000	NA				$ 650,000		$ 650,000
Third-Party Independent CQA Testing/Certification		10	MO	$ 75,000	NA				$ 750,000		$ 750,000
Seasonal Shutdown/Re-Mobilization		1	EA	$ 500,000	NA				$ 500,000		$ 500,000
Mobilization and Demobilization	2.0%	1	LS	$ 110,507	NA				$ 110,507		$ 110,507
INEEL Site-Specific Training/PRD/Work Order					1	LS	$ 147,260.18	$ 147,260.18			$ 147,260
Subcontractor Insurance/Bonds	2.0%	NA			NA					$ 125,662	$ 125,662
Pre-Final Inspection Report, Phase 2		NA			1	LS	$ 125,000.00	$ 125,000.00			$ 125,000
Subtotal											**$ 6,507,000**
Subtotal Subcontractor Directs - Phase 2 Remedial Action											**6,534,000**
Subcontractor Overhead	15.0%										$ 980,100
Subcontractor Profit	10.0%										$ 751,410
TOTAL REMEDIAL ACTION COST - Phase 2											**$ 8,266,000**
TOTAL COST - Phase 1 & 2 Remedial Action Contracts											**$ 708,034,000**
TOTAL CAPITAL COSTS											**$ 857,508,000**

OPERABLE UNIT 7-13/14 FEASIBILITY STUDY COST ESTIMATE FOR THE FULL ENCAPSULATION ALTERNATIVE

(continued).

Project Title: WAG 7 OU 13/14 Feasibility Study

PROJECT: WAG 7, FS COST ESTIMATES
OU7-13/14 DRAFT COMPREHENSIVE FS
SUBJECT: FULL ENCAPSULATION ALTERNATIVE
LOCATION: INEEL - RWMC

TYPE OF ESTIMATE: PLANNING

PREPARED BY: BKC
CHECKED BY: BS/LL
Reviewed/Updated: MAG 10/25/02

DESCRIPTION		MATERIAL/ EQUIP QTY	MATERIAL/ EQUIP UNIT	MATERIAL/ EQUIP COST PER UNIT	LABOR QTY	LABOR UNIT	LABOR RATE PER UNIT	TOTAL LABOR COST	TOTAL MATERIAL/ EQUIP	OTHER COST	TOTAL COST
POST-REMEDIAL ACTION OPERATIONS (100 YEAR DURATION)											
INSTITUTIONAL CONTROLS FOR 100 YEARS											
Install Permanent Markers/Survey		12	EA	$ 5,000	NA				$ 60,000		$ 60,000.0
Replace Perimeter Security Fence		10,000	LF	$ 20	NA				$ 200,000		$ 200,000.0
Repair and Replace Perimeter Signs		1	LS	$ 10,000	NA				$ 10,000		$ 10,000.0
Subtotal											**$ 270,000**
COVER MAINTENANCE											
Cover Maintenance Cost - 100 Year Duration Annual Cap Maintenance Costs		100	YR	$ 75,000	NA				$ 7,500,000		$ 7,500,000
Subtotal											**$ 7,500,000**
SURVEILLANCE AND MONITORING											
Groundwater Monitoring: (16-wells)											
Groundwater Monitoring, Quarterly for 2 Years - (8-Sampling Events)		8	EVT	$ 1,000	8	EVT	$ 11,000	$ 88,000	$ 8,000	$ 854,936	$ 950,936
Groundwater Monitoring, Semi -Annually for 3 Years - (6-Sampling Events)		6	EVT	$ 1,000	6	EVT	$ 11,000	$ 66,000	$ 6,000	$ 641,202	$ 713,202
Groundwater Monitoring, Annually for 95 Years (95-Sampling Events)		95	EVT	$ 1,000	95	EVT	$ 11,000	$ 1,045,000	$ 95,000	$ 10,152,365	$ 11,292,365
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 1,295,650	NA				$ 1,295,650		$ 1,295,650
Vadose Zone Monitoring:											
Sample 37 Lysimeters 1 Time per Year in Late Spring		100	EVT	$ 1,000	100	EVT	$ 17,875	$ 1,787,500	$ 100,000	$ 2,671,700	$ 4,559,200
Sample & Analyze 20 Vapor Ports 4 Times per Year for 5 Years		20	EVT	$ 1,000	20	EVT	$ 27,500	$ 550,000	$ 20,000	$ 140,000	$ 710,000
Sample & Analyze 20 Vapor Ports 1 Time per Year thereafter		95	EVT	$ 1,000	95	EVT	$ 27,500	$ 2,612,500	$ 95,000	$ 665,000	$ 3,372,500
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 864,170	NA				$ 864,170		$ 864,170
Surface Water Monitoring:											
Collect Sample from 2 Points 2 Times Every 5 Years (20 Sample Events)		20	EVT	100	20	EVT	$ 1,375.00	$ 27,500.00	$ 2,000	$ 320,660	$ 350,160
Vegetation Monitoring:											
1 Inspection per Year in Early Fall for 5 years		NA			5	EVT	$ 1,100	$ 5,500			$ 5,500
Re-seed 10 Acres Each Year for 5 Years (50 Acres Total)		50	AC	$ 15,000	NA				$ 750,000		$ 750,000
1 Inspection Every 5th Year in Early Fall Thereafter for 95 Years		NA			19	EVT	$ 1,100	$ 20,900			$ 20,900
Re-seed 10 Acres Every 5 Years		19	EVT	$ 15,000	NA				$ 285,000		$ 285,000
Air Monitoring (Radiological/Organic):											
Monitor 4 Existing CAMs		100	EVT	$ 1,000	100	EVT	$ 2,200	$ 220,000	$ 100,000	$ 15,300	$ 335,300
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 33,530					$ 33,530		$ 33,530
Perimeter Radiological Monitoring GPS with NaI Detector											
2 People, 1-Time per Year, 2 Days in Summer with Hummer & GPS		100	YR	$ 500	100	YR	$ 2,200	$ 220,000	$ 50,000		$ 270,000
Data Interpretation/Plot Data		100	YR	$ 750	100	YR	$ 2,500	$ 250,000	$ 75,000		$ 325,000
Replacement Parts/Equipment Costs (Assume 10% of Total Costs)		1	LS	$ 59,500	NA				$ 59,500		$ 59,500
Biological Monitoring:											
2 People once per year, First 5-Years for Intrusion Monitoring		NA			2	EVT	$ 1,100	$ 2,200			$ 2,200
2 People 1-Time, Every 5th Year thereafter for 95 years		NA			19	EVT	$ 1,100	$ 20,900			$ 20,900
Subtotal											**$ 26,216,000**
Subtotal Surveillance and Monitoring (Sampling & Monitoring Activities)											**$ 33,986,000**
WAG 7 MANAGEMENT											
WAG 7 Management (@ 5% of other post-RA operations costs)	5%				1	LS	$ 1,699,300	$ 1,699,300			$ 1,699,300
Annual Data Summary Report (100 reports @ 200 hrs/report)					20,000	HR	75.00	$ 1,500,000			$ 1,500,000
WAG-Wide RA 5 Year Reviews for 100 Years (20 5-year reviews @ 600 hrs/review)					12,000	HR	$ 75	$ 900,000			$ 900,000
Subtotal											**$ 4,099,000**
TOTAL COST - Post-Remedial Action Operations (100 Year Duration)											**$ 38,085,000**

Prepared by CH2M HILL 3/21/2002

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